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Editorial Policy

The policy of the publisher is to provide a medium for expression of views and for debate, within the traffic safety community, on a wide range of issues. The journal provides authors of papers with the opportunity to have their work submitted to the Editorial Board for peer review. Encouragement also is given to interested persons and organisations to submit articles, photographs or letters for publication. The publisher reserves the right to reject submissions or, with approval of the author, edit articles. No payment is offered for articles submitted.

For the purpose of sharing ideas with professional colleagues, material in this Journal may be reprinted with acknowledgement of the full reference, including the author, article title and the year and Volume of the Journal. In these cases, a copy of the reproduction should be sent, please, to the Managing Editor.

Cover photo: A ' Stop, Revive, Survive' rest stop beside the Federal Highway, NSW. *(See more information under 'Australian News')*

Contents

From the President

Dear Members,

January is often a time for reflection; a time to look back on the previous year and look forward (hopefully) to what you can achieve in the coming year. For the College, 2006 was a good year. We achieved an increasing engagement with the media, local and federal agencies and politicians to talk about road safety issues. Our advice is sought more often and our messages and policies are more widely quoted. Notable activities and achievements during 2006 included the National Pedestrian and Cycling conference held in Melbourne in June; a new seminar series on Older Drivers; numerous workshops and seminars held at the chapter level; and the presentation of a College Fellowship to Mr Lauchlan McIntosh by the Governor-General of Australia, His Excellency Major General Michael Jeffrey AC CVO MC (Retd) at Government House in Canberra. Finally, College members were very pleased to hear in late December that the Governor-General had agreed to serve as Patron of the College. This commitment by the Governor-General to support our work to improve road safety will assist us in spreading our message that road safety needs to be a priority for everyone.

2007 is already shaping up to be a very busy year for our dedicated staff and the ACRS and Chapter Executive Committees. I would ask you all to support your local and ACRS Executive in whatever ways you can.

One of the ways we can increase our credibility and influence in 2007 and beyond is to increase the number of members who apply for and are accepted as Registered Road Safety Professionals (RRSPs) with the College. The use of the postnomial ' RRSP' is a recognition to College members and the community that the member is an expert in a particular field of road safety. I would encourage you to consider applying to be on this Register, which will be on our website in the future. Members need to be an Associate Fellow to apply. (The Associate Fellow level of membership is based on self-assessment that the member is " Involved in professional or extensive voluntary work in road safety and has made a significant contribution to road safety.")

Just a reminder too that while College members are welcome to state that they are members of the College, this should not take the form of a postnominal or be used to imply any form of academic or professional qualification. The only exceptions to this policy are for those accepted and registered as a 'RRSP' with the College and those members who have been awarded Fellowships by the College. Fellows may use ' ACRS Fellow' as a postnominal.

On a couple of occasions during 2006, the National Executive became aware of and had to deal with instances where unauthorised statements, which purported to be made on behalf of the College, were made by individual members. We would just like to remind members that they are welcome to give their views on road safety issues, but not to give the impression that their views represent the general view of College members. The College has a range of policies that have been agreed to at Annual General Meetings (AGMs). These policies are updated and added to by our hard working policy sub-committee on an ongoing basis and are presented to members for their consideration and comments before being endorsed at an AGM. In addition to this, both the ACRS Executive and each Chapter has a media representative, who ensures that a consistent message is given. For more information on this, members should refer to the following policies on our website, or contact the National Office staff for copies:

1. Statement of College Membership by Members and the use of Postnominals
2. Code of Professional Conduct, and
3. Contact with the Media Policy

Finally, a word on the holiday road toll. Many members of the College have been busy over the Christmas period, both policing our roads and dealing with the aftermath of crashes. Those members who are on the frontline of this horror are to be esteemed by us all.

As professionals though, we know that the road toll, as measured by the average number of deaths per day, is not systematically higher or lower during holiday periods[1]. ATSB research found that over the five-year period to 2005, an average of 4.4 deaths per day occurred during the Christmas period, 4.6 during Easter, and 4.5 over the remainder of the year.

There is also no evidence that the holiday road tolls are influenced by broader seasonal trends. As one would expect, a slightly higher percentage of crashes occur on rural roads (54 per cent compared with 48 per cent), and consistent with this, more were on roads with a speed limit of 100 km/h or

[1]ATSB, 2006, Characteristics of Fatal Road Crashes During National Holiday Periods. Canberra: Australian Transport Safety Bureau. and ATSB 2003, The Characteristics of Fatal Road Crashes During the Christmas/New Year Holiday Period. Canberra: Australian Transport Safety

more (52 per cent compared with 45 per cent). These are not large differences and fit the expected pattern of people travelling longer distances for holidays. More vehicle passengers are killed and there is a lower proportion of crashes involving articulated trucks. In addition, there were no significant differences in the causal factors associated with crashes, namely fatigue, alcohol and excessive speed.

The Christmas holiday road toll in Australia was 62, compared with 83 for the 2005– 06 holiday period. In 1995– 96 the figure was 71. However, the Christmas holiday road toll from 1995– 96 up to 2006– 07 had a mean of 74. There is not a great deal of variability in the data. What we don't know is what the frequency rates are for these periods compared with the rest of the year. In other words, is the relative risk of a crash increased because (we believe) more people are travelling and that they are travelling longer distances? And does the reduced number of heavy vehicles on the road counter this and to what extent? On top of this, what would happen if there were no increased enforcement effort and saturation media warnings over the period?

What we do know is that more children under 15 die in road crashes at this time of the year. Those of us who work in death and injury data day in and day out can sometimes see numbers rather than people. We want to get the numbers down. However, people and the lives they live cannot be reduced to numbers. We feel this more strongly at Christmas but it applies equally to the whole year.

Kerry Fitzgerald
ACRS President

Letter to the Editor

Dear Editor,

The Amy Gillett Foundation, established after the tragic accident in Germany in 2005 involving the AIS women's cycling team, is working to reduce the incidence of death and injury caused by cars and bicycles colliding on our roads. It aims to promote shared respect and safe and responsible road use.

While the popularity of cycling in Australia is growing exponentially still, each year, an average of 35 cyclists are killed and 2,500 seriously injured on our roads. As the number of bicycles increases on our roads, everyone who uses the roads has an important role to play, and that is to be responsible every time we head out.

The AGF, in partnership with the Monash University Accident Research Foundation, are co-funding research, leading to the successful completion of a PhD, into the causal factors of car/bicycle collisions. This research will be ground breaking and will significantly fill gaps in what we know about these adverse interactions.

Applications are currently open for interested students, who can visit the Amy Gillett Foundation website – www.amygillett.org.au – for further information. As we know, road safety is an important issue and the AGF looks forward to making a valuable contribution.

Melinda Jacobsen

Diary

28 – 29 March 2007 – 2nd Road and Pavement Engineering and Management Conference at Carlton Crest Hotel, Melbourne. Contact: tel: 03-8534 5000; email: registration@ halledit.com.au.

28 June to 1 July 2007 – The Annual Australasian Road Rescue Conference and Challenge, conducted by the Australasian Road Rescue Organisation (ARRO) will be held at the Perth Convention Exhibition Centre, WA. Contact: Ron Adams tel: 08 9427 0866;
email: roadrescue2007@casm.com.au.

31 Oct – 2 Nov 2007: Australian Institute of Traffic Planning and Management National Conference at the National Convention Centre, Canberra.
Enquiries: Kim Thomas, tel: 08 8372 7878 or aitpm@aitpm.com

Quarterly News

Chapter News

Australian Capital Territory and Region

About 80 people attended a seminar on the safety of older drivers, organised by the ACT & Region Chapter on 30 October 2006. It was held at the Canberra Botanic Gardens conference centre and was sponsored by ACRS and the NRMA-ACT Road Safety Trust. The seminar took the form of presentations followed by a panel discussion chaired by ACRS President Kerry Fitzgerald.

Speakers were Robin Anderson, ACRS member who has recently completed a Churchill Fellowship studying older road users, Allan Brownsdon from the Council of the Ageing (ACT), Dr Bella Dinh-Zarr, a consultant to the FIA (Fédération Internationale de l'Automobile), Jim Langford of Monash University and ACT Chapter President and Chair of Road Trauma and Emergency Medicine at the ANU Medical School, Associate Professor Drew Richardson. Robin Anderson's report of his Churchill Fellowship study program is on the NRMA-ACT Road Safety Trust web site at www.roadsafetytrust.org.au.

Key messages from the Seminar included:

- Older drivers are much safer than commonly believed. They have relatively low crash rates and self-regulate well.
- There is almost universal agreement that age-based competency testing for older drivers has very little value as a means of identifying drivers whose driving is impaired. Better tools are needed to assess people's driving abilities.
- It is important to promote the idea of a ‘mobility transition’, where seniors gradually phase out driving and develop alternative mobility options
- Public transport is often inadequate to older people's transport needs and new systems need to be developed. Volunteer driver schemes and community transport seem very promising alternatives

There is agreement that older persons rely on their doctor to tell them when they should consider no longer driving, but that if a doctor does so, the immediate response in many cases is to reject the advice and go and find another doctor.

New South Wales (Sydney)

Plans for future seminars are as follows:

- Transport policy and road safety (February 2007)
- First UN Global Road Safety Week (April 2007)
- Decision making in driving (Second quarter, 2007)

Queensland

At the Chapter's December 2006 meeting, Graham Smith of the Driver Training Centre, Gympie, Queensland spoke about his road safety study visit to Sweden and his attendance at the Vision in Vehicles Conference held in Dublin, Ireland in July 2006. A shortened version of Graham's talk is given in the ‘Contributed Articles’ section of this Journal.

Victoria

A Distractions Hypothetical is to be conducted at the Treasury Theatre on the afternoon of 16 February, in which issues surrounding personal and company responsibility are investigated, as is the role of new in-vehicle technologies as a high-risk distracter in vehicles. Representatives from Victoria Police, the TAC, the Municipal Association, WorkCover and VicRoads will help to form the panel for discussion. A seminar on Older Drivers is planned for 13 March, with Robin Anderson as the keynote speaker. Robin has worked in transport research, policy and operations for over thirty years at all three levels of government and has recently investigated the challenge of keeping older road users safe on Australia's roads

Australian News

ACRS Fellow Receives Australia Day Honour

Congratulations to Mr Lauchlan McIntosh, ACRS Fellow, for being awarded Member (AM) in the General Division of the Order of Australia on Australia Day this January.

NSW Aims to Reduce P plate speeding

The NSW Government has been running an advertising campaign targeting P plate drivers, who are over-represented in speed related fatal casualty crashes.

Speeding is a contributing factor in 40 per cent of fatal crashes involving P-plate drivers. The number of people killed in NSW in crashes involving a P-plate driver increased last year, from 73 in 2005 to 94 in 2006. More than 80 per cent of speeding casualty crashes involving P-plate drivers have occurred in urban areas including 60 per cent in Sydney region. Of all speeding drivers involved in fatal crashes between 2001 and 2005: 20 per cent were 17-20 years of age and 16 per cent were 21-25 years of age. The campaign aims to increase awareness of the Police enforcement operation targeting speeding young drivers.
(Source: NSW Government's Roads and Traffic Authority)

Changes to Northern Territory Road Rules Aim to Enhance Safety

On average, one person is killed and nine are seriously injured on NT roads every week. In an effort to reduce this carnage, the NT Government established the Road Safety Taskforce in January 2006 to work out how to reduce the Territory's shocking road toll. The Taskforce reported back to Government with 21 recommendations aimed at changing the road use culture. As a result, the NT Government introduced new road rules on 1 January 2007. Penalties for a range of road safety related offences have been increased, in many cases doubling existing penalties; enforcement has been stepped up, road safety education is being improved and speed limits have been introduced where previously there were none – 130 kph on some major highways and 110 kph on all other rural roads unless otherwise signed. *(Source: NT Government)*

Queensland Introduces Further Road Safety Initiatives in 2007

Because 77 people were killed in 2005 as a result of drink driving, a new rule will be implemented in mid-2007 to impound the vehicles of repeat drink drivers. Because over 30% of all road fatalities in 2005 involved young people, new licensing rules and regulations and better education for young drivers are planned for mid-2007. Because 330 people died on Queensland roads in 2005, tough new penalties are on the way for needless driver distraction and reckless behaviour.

Training with Collision Analysis Software

Specialists in collision investigation from around Australia attended a training course in December 2006 at the Australia Federal Police College in Canberra. The aim of the course was to familiarize the investigators with the latest specialist software designed to assist in the investigation of collisions involving pedestrians and/or cyclists. Course instructors were Mike Reade and Tony Becker, from the Florida-based Institute of Police Technology and Management. *(Source: Canberra Chronicle 5 Dec 06)*

Third Indigenous Road Safety Forum

The Australian Transport Safety Bureau, together with the Office of Road Safety in Western Australia, convened the 3rd Indigenous Road Safety Forum from 23-25 October 2006 in Broome. The Hon Jim Lloyd MP, Australian Government Minister for Local Government, Territories and Roads opened the forum. About sixty people from a range of professions in the health, safety, justice and education sectors attended. Delegates discussed issues identified by a previous forum in 2004 and recommendations of a research study Australian Indigenous Road Safety – 2005 Update commissioned by the Australian Government. Issues related to the need to:

- improve the accuracy of national road trauma statistics
- increase driver licensing rates
- involve indigenous communities in road safety efforts
- improve road safety behaviours relating to seatbelt wearing, alcohol use, riding in open load spaces and pedestrians
- research into attitudes toward health and injury
- conduct formal evaluations of initiatives
- apply enforcement activity to address known risky practices.

Brian Kidd, member of the ACRS Executive and WA Chapter Representative attended the Forum in his capacity as Road Safety Manager, Main Roads WA. Commenting on the Forum, he said, "My overall impression was that there's a lot of people doing many useful things for indigenous road safety that I wasn't aware of, but perhaps there is a need also to concentrate on only one or two key issues…The key issues for me are indigenous driver training and licensing, where offences for driving without a valid MDL automatically involve a mandatory 12 months goal term (at least in WA). The push for more hours of mandatory driver training under the new graduated driver licensing systems such as introduced in WA, and as championed by the College, works against indigenous communities. There are examples in WA of nearly whole communities in goal at any one time for not having a valid MDL… Another barrier to applying for a MDL was the issue of identity, where many indigenous people cannot produce a birth certificate. The paperwork and forms required to get around this problem encourage unlicensed driving."

Volunteers Helping to Save Lives and Injuries

Over the holiday period an untold number of volunteers was out running roadside rest stops for tired motorists. They deserve our recognition and thanks for their sterling work. Two such volunteers were Barry and Carole Dobing, Salvation Army members from Goulburn NSW, who took their refreshment van and equipment to the Kevin Wheatley VC Rest Area at Lake George on the Federal Highway. They had a steady stream of thirsty customers for their free tea, coffee and soft drinks. Shade conditions at the site were not, however, ideal for them to work in on a very hot day. They are hoping to be able to raise enough funds to build a permanent and more appropriate shaded area at this site.

Barry and Carole serving a customer with free coffee at their 'Stop, Revive, Survive' site.

New Laws to target the causes of heavy vehicle speeding

Companies and individuals who set unreasonable delivery deadlines will face tough penalties under proposed new speed compliance laws. Underlying causes of heavy vehicle speeding will be targeted by new Chain of Responsibility laws proposed by the National Transport Commission (NTC). The reform requires all parties in the logistics chain to take " reasonable steps" to prevent a speeding offence.

ACRS Register of Road Safety Professionals – Announcement

The ACRS Executive Committee is pleased to announce that Mr Donald Veal has been added to the Register in the discipline of Road Safety Audit.

To be listed on the Register, applicants must already be in Associate Fellow membership of the College and satisfy a panel of experts that they have acquired a high level of academic qualifications and experience working in their particular discipline. Application forms and minimum qualifications and experience details may be downloaded from the ACRS website – www.acrs.org.au.

ACRS Member Appointed Research Director in France

After nearly 10 years at the Monash University Accident Research Centre (MUARC), A/Prof. Mike Regan has been seconded to France, for 3 years from April 2007, as a Research Director with the French National Institute for Transport and Safety Research (INRETS). Mike and his family will be based in Lyon and will spend most of his time with the INRETS Laboratory for Ergonomics and Cognitive Sciences for Transport (LESCOT). He will spend about a week a month at INRETS' Modelling, Simulation and Driving Simulators (MSIS) laboratory, in Paris. Mike will create and contribute to French national and European-Commission funded projects in the road safety area, develop ongoing research collaborations between Monash University, INRETS and other European institutes and supervise PhD students. A major focus of his research activities will be Human Machine Interface (HMI) design and evaluation for the automotive industry, which will complement similar research he and his group at MUARC are currently undertaking for the Australian automotive industry as part of the Cooperative Research Centre for Advanced Automotive technology (AutoCRC).

PhD Scholarship Opportunities in Australia

The Centre of Accident Research and Road Safety at the Queensland University of Technology (CARRS-Q) has several PhD scholarship opportunities for 2007 in the areas of international visitor safety, fleet safety, older drivers, social intelligent transport systems (ITS) interface, ambient intelligence in vehicles, and modelling the driving task as a complex system. If you have a related topic which you would like to develop into a PhD or Masters study, please contact Kerrie Livingstone on Ph: 07 3138 4592 or email: k3.livingstone@qut.edu.au.

The Amy Gillett Foundation, in partnership with the Monash University Accident Research Foundation (MUARF), is offering the Safe Family Research Scholarship for studies leading to completion of a PhD. The successful candidate will undertake studies at the Monash University Accident Research Centre and will be expected to conduct research into crashes and interactions involving different classes of road users, particularly motorists and cyclists. The scholarship offers an annual stipend of $25,118 for three years, with the possibility of extension.

Candidates should hold a relevant degree/s in the areas of psychology, public health, epidemiology or related disciplines, preferably at first class honours level….Applicants must be Australian citizens. Applicants should complete the Expression of Interest form available at http://www.monash.edu.au/muarc/postgraduate/index.html. For enquiries, contact Ph: (03) 9905 4371 or email: enquire@muarc.monash.edu.au

Applications are now invited for the third John Lane Memorial scholarship with the Monash University Accident Research Foundation (MUARF),. Candidates may have a degree in any discipline relevant to injury prevention, preferably at first-class honors level. The successful candidate will undertake their studies at the Monash University Accident Research Centre in one of the following broad areas: Injury prevention in the ageing population; product safety and technology impact; implementation and evaluation methods in injury prevention; road transport and vehicle safety; and injury prevention in the workplace. The scholarship offers a stipend of $25,118 pa for three years, with the possibility of extension.

Inquiries: Post-graduate Studies Administrative Officer, Accident Research Centre,Building 70, Clayton Campus, Monash University, Victoria 3800. Ph: 9905 4371 or Email: enquire@muarc.monash.edu.au

Flinders University : NRMA - ACT Road Safety Trust Research Centre for Injury Studies: Postgraduate Research Scholarship

The External Closing Date of 22 January 2007 has been extended. The purpose of the Scholarship is to encourage graduates to obtain formal training in primary health care in the area of injury studies relevant to road safety. All candidates must enrol for a higher degree requiring full time research at the Flinders University of South Australia. Scholarships will be held within Australia.

The Research Centre for Injury Studies is a specialist injury surveillance unit with expertise in the area of serious (mortality and morbidity) injury within Australia. As such applications will be considered in areas of road safety relevant to surveillance, monitoring and the functions of the Centre. Normally the maximum period of the award will be three years if initial postgraduate degree enrolment is concurrent with commencement of the Scholarship. The stipend is currently $30,000 per annum and makes allowance for a limited amount of other work to be carried out within the Research Centre for Injury Studies. An allowance of $5,000 p.a. for conference/field work is available. Thesis production expenses of up to

$840 will also be provided. Relocation expenses of up to $1,500 will be made available if required. Additional information can be obtained by contacting Dr Sophie Pointer, Assistant Director, Research Centre for Injury Studies, Ph: (08) 82017602, or via the mail address sophie.pointer@flinders.edu.au

Graduate Certificate/Diploma Study Support Scheme

The Centre of Accident Research and Road Safety at the Queensland University of Technology (CARRS-Q) will be running road safety courses at the Graduate Certificate and Graduate Diploma levels this year. Late applications (after 12 January) may be made to Kerrie Livingstone on Ph: 07 3138 4592 or email: k3.livingstone@qut.edu.au. For further information visit www.carrsq.qut.edu.au where you will be able to locate a brochure and download a Postgraduate Application form. The Study Support Scheme is offering a number of scholarships and will cover the cost of one unit of study. Please contact Kerrie Livingstone for the full terms and conditions of this scheme.

New Zealand News

Cycle Safe Project for Christchurch

The Land Transport NZ Board has approved funding of $277,000 for 2006/2007 for the Christchurch City Council's Cycle Safe program. This is an educational program for primary schools in Christchurch, aimed at providing Year 6 students with the vital skills needed to cycle safely to school. This program is part of an overall strategy to encourage cycling in Christchurch. (Source: Land Transport NZ News December 2006

Refresher Course for Senior Citizens

When is the best age to have a refresher course for one's driving? In New Zealand a refresher driving course called ‘ Safe with Age’ is aimed at drivers aged 55 and over. The course is run by local groups, such as Age Concern, in which participants follow a classroom-based program. This is designed to be thought-provoking and informative, while at the same time being enjoyable and informal. The NZ Government's stronger emphasis on education follows the discontinuation of the mandatory older driver practical test in December 2006. (Drivers aged 75 and over will, nevertheless, still need a medical certificate from their doctor). Starting on 1 February 2007, the Government plans to enhance the course content and to provide a financial incentive of $30 to encourage senior citizens to take part. The course will include an assessment session with an approved Safe with Age driving instructor. The practical session is not a test, but will focus on basic skills appropriate for older drivers. The new course will be available from 1 February 2007. (Source: Land Transport NZ News December 2006)

European News

Daylight Saving to improve road safety?

UK Member of Parliament Mr Tim Yeo has tabled a Private Members Bill to put UK time forward by one hour across the year for a trial period, in order to create lighter evenings. Road safety campaigners have been saying for some time that road casualty rates increase with the arrival of darker evenings and worsening weather conditions in the winter. The most recent research estimates that adopting ‘ British Summer Time’ for the whole year in the UK would result in around 450 fewer road deaths and serious injuries, including between 104 and 138 fewer deaths. The Bill was due to be read a second time on Friday 26 January. According to Parliamentary process, the Bill needed 100 MPs in the Chamber to vote in order for it to be taken forward to Committee Stage. The main objection to changing standard time in the UK is that the northern regions would not get light until mid morning in mid winter. [Editor: Multiple time zones could resolve this, but, as we know from Australasian experience, multiple time zones are inconvenient, and in the smaller land area of Great Britain could be even more difficult.] (Source: Parliamentary Advisory Council for Transport Safety)

Daytime running lights

Discussion is taking place in the UK regarding the possibility that daytime running lights (DRLs) will prove detrimental to motorcyclists' safety. Dr Stephen Ladyman, Minister of State for Transport, supports this view, and has been trying hard to convince his ministerial colleagues around the European Union not to mandate their use. He made a presentation to this effect in Verona at a Road Safety ministerial conference recently. DRLs could be of 2 types – dedicated special low-wattage lights designed for constant use or simply dipped headlights. Dr Ladyman opposes both types in the UK, and especially the latter. A recent report commissioned by the Minister showed that the European Commission's assessment of any possible benefits was over estimated. [Editor: With support for DRLs growing in Australia and New Zealand, including from the College (see ACRS policy on DRLs), it will be interesting to see how local motorcycling communities respond.] (Source: Parliamentary Advisory Council for Transport Safety)

UK Accidents Assessed from a Cost Perspective

Little emphasis has been given in the past to the cost to the national economy of road crashes. Governments are, however, increasingly realising that monies expended on prevention not only save lives and prevent injuries, but also have significant economic benefits. When the overall financial cost to the community of road crashes is calculated, it provides a strong argument for implementing what may previously have seemed to be overly expensive preventative measures. In the UK in 2005, there were 2,913 fatal accidents, 25,029 serious accidents and 170,793 slight accidents reported. In cost-benefit terms, the value of prevention of all these accidents has been estimated at £12,807 million, (Aus$32,000 million). In addition there were an estimated 3 million damage-only accidents valued at a further £5,044 million (Aus$12,610). Further information is available on these figures at www.dft.gov.uk under Road Safety/Economic Assessment.

European Driving Licence

The European Union is moving towards the introduction of a European Union -wide driving licence by 2012. The licence, currently the subject of new legislation in the European Parliament, will take the form of a plastic card, with or without an electronic chip containing the data printed on the card. The validity period will be up to 15 years, with member states being able to choose a 10 year period if desired. National licences will be phased out from 2012 and 2032.
(Source: ETSC Safety Monitor 67, December 2006)

Belgian Road Safety Progressing Well

New figures published for road traffic deaths between 2001– 2005 indicate that Belgium is on track to achieve its part in reducing the road toll by 50% by 2010. Belgium's Minister for Mobility attributes this progress to a revised set of road traffic offences, campaigns and increased traffic police controls. *(Source: ETSC Enforcement Monitor 08 Nov 2006)*

Drivers and Alcohol

The European Commission has adopted a Strategy on Alcohol Harm Reduction. This acknowledges that " A combination of strict enforcement and active awareness-raising is a key to success." **Germany** has introduced an alcohol prohibition for novice drivers from January 2007. This will prohibit any alcohol consumption for young drivers during the two year probation period. The **Czech Republic** recently launched a nation-wide anti drink driving campaign at a pop concert. Aimed at young people, the campaign uses posters, leaflets and a specially made hip hop music video called ' Be Aware' to alert them to the dangers of drink driving. The campaign is being supported by increased police enforcement. A successful alcolock program in the Haute Savoie region of **France** is being extended into 2007. The past program saw a zero recidivism rate after the end of the program. A further 200 convicted drink drivers will take part in the program.
(Source: ETSC Enforcement Monitor 08 Nov 2006)

Seat Belts Developments

New seat belt legislation came into force in the UK on 18 September 2006. In relation to this, a campaign to raise awareness on the need to use child safety restraints in cars and seat belts in coaches was launched by the UK Government's THINK! Program. Part of the campaign included not only advice on the correct child seat, but also a list of tips as to how to persuade, especially unwilling, older children to use the correct retraint. The new rules were supported by a £30 penalty for non-compliance. The UK's Department of Transport claims that 2,000 child deaths and injuries could be prevented annually with full compliance of the new rules. Sweden is considering more than doubling fines for not wearing seat belts, although that nation's seat belt wearing rate is among the highest in the world at 92.4% for drivers in 2005. The lowest seat belt wearing rates tend to be in urban areas, so enforcement efforts are concentrated in those areas. (Source: ETSC Enforcement Monitor 08 Nov 2006)

North American News

US Government wants tougher car safety tests

Proposals have been put forward to make it harder for vehicles to earn top scores in the US Government's New Car Assessment Program star rating system for vehicle safety. Proposed new legal requirements for car makers would change how the government conducts tests that are used to assign its safety ratings. Federal officials are concerned that the current test regime does not differentiate adequately between the safety levels of different vehicles, since most now receive a four or five star rating. The call by U.S. Transportation Secretary Mary Peters to reform the 27-year-old New Car Assessment Program comes nearly two years after a Government Accountability Office report suggested the government's safety rating system was ineffective.

The proposal would toughen frontal, side and rollover tests conducted by the National Highway Traffic Safety Administration. The changes would include beefing up frontal tests to rate vehicles not only on the incidence of head and chest injuries, but also for upper-leg injuries. "We want to see those who are employing new technology receive the higher star ratings," Peters said.

In recent years crash tests conducted by other groups such as the Insurance Institute for Highway Safety have highlighted safety flaws in many vehicles that continued to get top marks in government tests. The proposals under consideration include using smaller dummies to mimic female drivers, increasing speeds in some crash tests and adding to the weight of crash barriers to account for heavier vehicles on the roads.
(Source: David Shepardson / Detroit News Washington Bureau 9 January 2007)

Asian News

India: Punjab State Roads Sector Project

An IBRD loan of US$250 million has been made by the World Bank to assist the Government of Punjab to provide a targeted approach to the comprehensive improvement and maintenance of the 7,400 km of Plan Roads (state highways, major district roads and other district roads), which link the rural road network to the National Highways and provide most of the main road links in Punjab. Although not a specific road safety project, the improved highways are likely to result in fewer road crashes. (Source: www.worldbank.com)

World Bank Supports Road Safety in Vietnam

The Vietnamese Ministry of Transport has borrowed US$31.73 million for a major road safety project, implemented by the National Traffic Safety Committee. The project, approved in June 2005 and continuing to December 2009 aims at reducing the rate of accidents, injury, and death associated with road transport, through physical improvement works, and institutional development to strengthen the management of road transport safety. The project has three components. The first is providing technical assistance to strengthen the management and technical capacity of the National Traffic Safety Committee (NTSC) Executive Office, and the Traffic Safety Project Management Unit (TSPMU), and will further prepare a national road safety strategy. The second component will assist the government in developing, and implementing comprehensive, integrated safety programs, which includes the enhancement of road safety auditing processes, and funding of blackspot treatments, for three high-risk road corridors. In addition, a program of road user education, traffic safety enforcement, and emergency service preparedness along the three demonstration corridors will be implemented. Finally, the third component will support the development of a national road accident database system, to be used initially by the Vietnam Road Administration (VRA) to enhance the identification and treatment of blackspots, and by the Ministry of Public Safety to improve enforcement strategies and priorities. *(Source: www.worldbank.com)*

Contributed Articles

First United Nations Global Road Safety Week

By Geoff Horne

This special road safety effort will be a worldwide event in the week 23-29 April this year. The project was actually launched by means of a United Nations General Assembly resolution (A/60/5) in October 2005. In announcing its plans, the UN said:

" The Week, which will focus on ' Young Road Users' , is an historic opportunity to raise the issue of road traffic injuries to a higher level." During the Week, it is expected that hundreds of initiatives – local, national, regional and global – will take place around the world, organised by governments, nongovernmental organisations, United Nations and other international agencies, private sector companies, foundations and others working for safer roads. The key global event will be the World Youth Assembly for Road Safety, bringing delegations of young people together from many countries to discuss and adopt a youth declaration on road safety and define ways to better serve as road safety advocates in their countries. It is hoped that the Week will be marked in all countries and by many communities. It is intended that the events of the Week should serve as launching points for new and effective road safety initiatives in the years ahead.

The main objectives of this First United Nations Global Road Safety Week 2007 are to:

- Raise awareness about the societal impact of road traffic injuries, highlighting the risks for young road users; and
- Promote action around key factors that have a major impact on preventing road traffic injuries: helmets, seat-belts, drink driving, speeding and infrastructure.

The slogan "Road Safety is No Accident" was chosen to emphasise that deliberate efforts are needed by many individuals and many sectors of society – governmental and nongovernmental alike in order to achieve safety on the roads.

Global activities

International events for the First United Nations Global Road Safety Week will take place in Geneva, Switzerland, and will involve those in a position to influence policies and programmes related to the safety of young road users, as well as children and young people themselves. The following events will be held:

World Youth Assembly for Road Safety, 23-24 April 2007, when young delegates from all regions of the world will gather to exchange ideas and adopt a resolution calling for action on road safety.

The Second Global Road Safety Stakeholders' Forum, 25 April 2007, when representatives of governments, United Nations agencies, civil society and the private sector will meet to " share perspectives and ways to advance road safety efforts around the world" . The first Forum was held in 2004.

Resources

A special three-part logo has been designed and is available to all partners preparing related events and materials for the Week. For more information visit http://www.who.int/roadsafety/week/en/. A toolkit is also available for events organisers.

ROAD SAFETY IS NO ACCIDENT

Message from the (now retired) UN Secretary-General Kofi Annan on the announcement of the First UN Global Road Safety Week, 23-29 April 2007

" The First United Nations Global Road Safety Week is an important opportunity for improving safety for the hundreds of millions of young people who travel the world's roads every day.

Since World Health Day 2004 and subsequent discussions in the United Nations General Assembly, governments and their partners have paid increased attention to road safety. But we still have a long way to go. Road traffic collisions kill nearly 1.2 million people worldwide every year, and injure millions more. They are the second leading cause of death for people aged 5 to 25, with devastating impact on families and communities. Among this age group, young men – as pedestrians, cyclists, motorcyclists, novice drivers and passengers – are nearly three times more likely to be killed or injured on the roads than young women.

Fortunately, there is a growing recognition that road traffic injuries can be prevented. It has been demonstrated in a number of countries that by acting on key factors, in particular drunk driving, speeding, infrastructure and the wearing of helmets and seat-belts, a significant number of lives and financial resources can be saved even as motorisation continues to rise.

Road safety is no accident. Road safety happens through the deliberate efforts of many individuals and many sectors of society, governmental and non-governmental alike. Every one of us has a role to play: ministers of transport, health and education; health care providers; automobile associations; educators; students; insurers; vehicle manufacturers; the media and victims of road traffic crashes and their families. But a strong commitment at the political level is crucial. Today's success stories often result from a decision at the highest level of government to improve safety on the road.

Through the World Youth Assembly for Road Safety – the key global event of the First United Nations Global Road Safety Week – the World Health Organization, UN Regional Commissions and their partners are giving a voice to young people. Let us listen to their advice. And let us improve safety on the world's road, for their sake and for ours."

Advocating Global Road Safety

By Lori Mooren, Principal Consultant, Fleet and Road Safety, ARRB Group Ltd

The spate of youth road fatalities that we have seen in New South Wales in the last quarter of 2006 represents tragedies that no community should have to bear. These are made all the more tragic to those of us who know how these kinds of events can be prevented. There are evidence based solutions.

In Australia we have influenced significant change in community and political attitudes in favour of road safety in recent times. But somehow, we as a road safety " profession" have not entirely convinced the global – or even the Australian community – that it is best to choose safety intervention over " personal freedom" or other socioeconomic benefits.

Within the Australasian College of Road Safety, we have debated to what degree we should be a community advocate versus a professional support organisation. For a while, many of us took the conservative view that we should work towards a strengthening of our members' skills and knowledge before we embark on public advocacy. This has been a sensible approach. But increasingly, we are finding a role in 'advising' community leaders on some key issues. We have established a series of policy positions on major road safety issues based on our collective knowledge base. Beyond this we have organised seminars and forums for public discussion as well as responded to questions by media organisations.

In doing this we must not forget that road safety is a political issue. Many of the things that help to prevent road trauma present costs to the community. Whether it be in economic or social terms, the people and governments that represent them must make choices about doing things that will produce both beneficial and costly consequences. So the question becomes " are the restrictions that governments impose in the interest of road safety going to be acceptable to community."

Over the past 3 or 4 decades we have seen quite marked shifts in Australian community attitudes with regard to road safety measures. The most significant shift we have seen is the support for random breath testing and the growing social disapproval of driving while under the influence of alcohol. Less so, but definite, has been the shifts in attitudes toward the problem of speeding. There is far more public demand for speed enforcement now than there ever has been. These shifts in favour of road safety measures have come about as a result of deliberate road safety campaigns that have combined public education with other interventions, most importantly enforcement and penalty increases.

Even more so, governments in developing countries are making more or less deliberate choices about whether or not to embrace road safety as a community priority. Even in countries that have ten times the road trauma levels that we have in Australia are seemingly more committed to rapid road development than to address the rapidly growing incidence of road fatalities. The logic appears to be that rapidly growing economies need to rapidly develop road infrastructure to meet the demands of this activity. And this growth will reduce poverty quicker, which in turn improves the health, and indeed the life expectancy of the people.

How sadly ironic. Both sides of the argument have a point. However, the reality is that the rush to reduce poverty is in effect resulting in an exponential growth in road deaths. We are also learning more about how road death and injury contributes to poverty – of families and of communities.

There have been a few studies that have begun to demonstrate this. And at macroeconomic levels road crashes consume 1-2% of national gross domestic products. Studies that demonstrate the links between poverty and road injury are needed to help governments to make more informed choices in the development of public policy and in the management of community resources.

" Every 3 minutes a child dies on the world's roads."
The Commission for Global

Road Safety, chaired by Lord Robertson (former UK Cabinet Minister) uses these kinds of words to implore governments, especially the G8, to take action now to reduce this tragedy. Thus the sponsor, FIA Foundation, is embarking on a global campaign to draw attention to this issue.

In China alone someone dies every 4– 5 minutes in a road crash. Globally 3,000 people die every day. It is conservatively estimated that 1.2 million people die each year on the world's roads. An additional 20-50 million more people are seriously injured every year. Moreover, road fatalities and injuries are predicted to increase by 67% by the year 2020

Yet huge social costs have been imposed in the form of increased air travel security following the so-called 9/11 event that killed equal to the daily road toll as a one-off, while relatively little concerted effort is made to address road deaths.

Beyond the Commission's work, Ambassador Al-Hinai, Oman's Permanent Representative to the UN, has advocated a more proactive approach to addressing the problem of road injury. This has raised awareness to the issue and built stronger political will to do something. As a direct result of these efforts, the United Nations held two historic meetings on April 14th and 15th 2004, resulting in the UN General Assembly passing resolutions committing member States to collectively pursue a more active approach to road safety.

While there hasn't been a resounding groundswell of greater public commitment by the G8 nor indeed of any of the UN members, some agencies have made efforts to improve their support for road safety. For example, the World Bank has established a "facility" for financing road safety programs and projects. The Fleet Forum was also established with the purpose of guiding UN agencies for road safety improvements amongst their own staff and contractors who deliver humanitarian aid to remote communities using dangerous roads. And the Danish Government through DANIDA have financed a pilot fleet safety project.

So advocacy does work. We need to guard against complacency and remember to keep finding ways of pushing road safety onto the public agenda.

But there are enormous challenges of advancing road safety:

- in countries where police are corrupt or ill-equipped to enforce traffic regulations,
- in countries that are so rapidly developing economically that there is an intense rush to build big high-speed roads – at any cost,
- in countries that have vehicle fleets of 1960s standards in terms of occupant safety (including an absence of seatbelts),
- in countries where a small motorbike is the family vehicle, and
- in countries where government agencies don't have the skills and knowledge that good performing countries have developed over the past few decades.

The practical challenges are big. The technical challenges of building capacity and adapting good practices from good performing countries are also sizeable.

Collaboration members, the WHO, GRSP, the FIA Foundation and the World Bank, are producing a series of good practice 'how to' manuals for low and middle income countries. ARRB in partnership with the TRL (UK) and VTI (Sweden), is currently working on the speed management manual. The helmets manual is currently being introduced through workshops in a number of Asian countries. Separately the FIA Foundation is financing a pilot international Road Assessment Program (iRAP), which gives roads safety ratings (with stars – similar to NCAP). And the World Bank Facility is financing a number of other initiatives, including one to build a good practice global network of traffic police.

But the political hurdles to engendering a strong commitment to road safety are enormous. This is why advocacy is an important part of road safety.

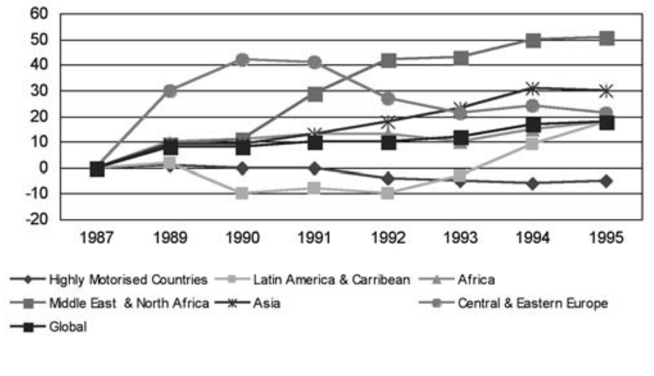
During the recent meeting of the UN RS Collaboration many lamented the lack of action in response to all of our efforts to stimulate some commitment by global leaders and infrastructure financiers, like the World Bank, regional Development Banks and bi-lateral donors, including AusAID. But as one participant pointed out, the countries themselves have got to be encouraged to call for this kind of assistance. We can't just rely on financiers placing conditions on funding agreements to ensure that road safety gets incorporated into projects.

Perhaps the Australasian College of Road Safety can play a role in this challenge. A number of individual road safety researchers and practitioners have approached us to join or link with us somehow. The GRSP is also interested in how we could assist in guiding others in the Region to set up a membership based organisation to advocate good road safety practice.

The College, with its broad skill and knowledge base as well as the energy and commitment of its members is well placed to take part in global good practice road safety advocacy.

More broadly, Australia has a role on the global stage. Australian jurisdictions, despite our shortcomings in road safety, have led the world in some very important advances and achievements over the past few decades. We need to continue to lead by example. We can also offer our experience, both positive and not so, to help others in the world to expedite the development and implementation of strong road safety programs.

The first Global Road Safety Week, 23-29 April, 2007, with a focus on youth, presents an opportunity for us to showcase our achievements in road safety. It also presents an opportunity to spearhead some actions to address youth road safety as well.



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www.grspRoadSafety.org

www.makeroadssafe.org

www.who.int/roadsafety

Curbing Roadside Hazards

By Greg Smith, Research Manager,
Australian Automobile Association

This article was contributed by SaferRoads www.aaa.asn.au/saferroads

Introduction

In 2004 the ACRS published “ Road Safety Towards 2010” – a compilation of expert views on what was needed to achieve the National Road Safety Strategy (NRSS) target of a 40% reduction in the road crash death rate by 2010. By the time the review was published, the road death rate had been trending downwards and was only slightly above the pro-rata target. Many contributors to the review, while noting the need to maintain the effort to improve safety, were cautiously optimistic. Now however, three years since the College review was published and with four years remaining in the national strategy, the task of achieving the national target is more daunting than ever.

Road deaths in 2006

During 2006, 1,605 people were killed in road crashes, which is 22 (1%) less than in 2005, but 22 (1%) more than the 1,583 deaths that occurred in 2004– when the College review was written. The improvement in 2006 over the 2005 result was led by South Australia, with 31 (21%) fewer deaths, the Northern Territory with 13 (24%) fewer deaths and the ACT also with 13 (50%) fewer deaths. Notably, the 2006 result in South Australia was 19 fewer than the previous low of 136 deaths, recorded in 1953.

As shown below in Figure 1, reductions were also recorded in Victoria and NSW. Unfortunately Western Australia, Queensland and Tasmania each recorded more deaths in 2006 than in 2005. The increase in Western Australia of 40 (25%) deaths is particularly concerning.

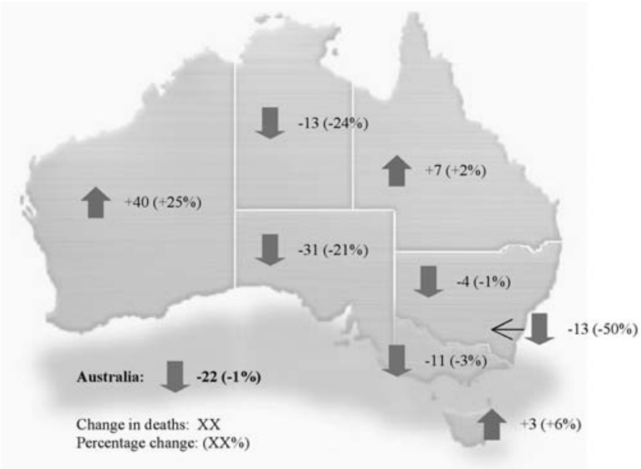

Figure 1 Change in road deaths between 2005 and 2006
Source: Australian Transport Safety Bureau Fatal Road Crash Database

A step backward

By December 2006, the national death rate per 100,000 population was 7.8. Although this is an improvement on the rate of 9.3 at the beginning of the Strategy, it is actually higher than the January 2005 rate of 7.7. That is, during the past two years the national road fatality rate has gone backwards. The effect of this is that since the start of 2005, the gap between what would be expected if we were on target and the actual death rate has grown, as shown below in Figure 2.

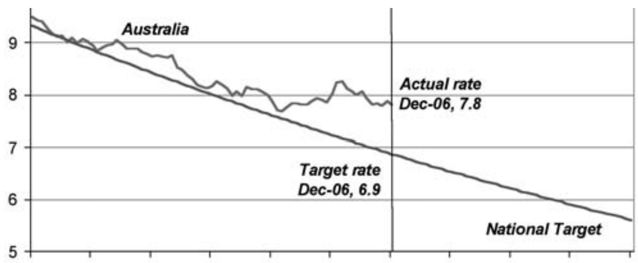

Figure 2 National road death rate versus National Road Safety Strategy target (deaths per 100,000 population
Source: Australian Transport Safety Bureau

In order to achieve the December 2006 target rate of 6.9 deaths per 100,000 population, the number of people killed on Australian roads in that year would need to have been 1,411–194 deaths lower than the actual number of 1,605. In fact, if Australia had been 'on target' every year since the Strategy was implemented, then approximately 550 additional lives would have been saved. Clearly, much greater efforts are needed if the 2010 target is to be achieved.

National Road Safety Action Plan 2007-08

The new National Road Safety Action Plan 2007–08 (NRSAP) provides a number of explanations as to why we are behind. These include:

- growth in the number of kilometres travelled on the roads is higher than expected;
- with the exception of Victoria, speed management improvements have been incremental;
- investment in road infrastructure has remained fairly constant - greater investments are needed in order to produce greater benefits;
- the uptake of technology to encourage seat belt use and increase speed awareness and the installation of electronic stability control in new cars has been slower than anticipated; and
- other factors such as ' learning effects' , whereby motorists learn where enforcement is likely to occur, and driver distraction, including the use of mobile phones, has increased.

Despite these mitigating factors, the NRSAP argues that a ' step down' in road deaths is possible, given a concerted effort by all those involved in road safety across numerous action areas. One of these action areas, road infrastructure, and in particular, roadside safety, holds enormous and arguably as yet largely untapped potential.

Roadsides should not be sidelined

The 2007-08 NRSAP notes that low-cost, safety focused treatments like erecting roadside barriers are associated with substantial crash and injury reductions. It also acknowledges the significant work being done in this area by VicRoads as part of the $130 million Safer Roads program. However, such large-scale, targetted programs appear to be the exception rather than the rule.

At least part of the reason for this is that roadside safety does not generate a great deal of interest for the community, and so is arguably sidelined both in public debates and in policy making. Evidence of this can be seen within the issue young driver safety, which was one of the defining issues of 2006, particularly for NSW.

Nationally, 112 drivers aged between 16 and 20 were killed on the roads, 15 (15%) more than in 2005. In NSW, 39 drivers of that age were killed, an increase of 15 (63%) on the previous year.

One crash in particular drew considerable community and media attention. In October 2006, four young teenage boys, three aged 16 and one aged 17 were killed when their Holden Commodore ran off the road near Byron Bay, in northern NSW. The car, which was being driven by another 17 year old boy – who actually survived the crash – hit a number of trees before stopping on an embankment. The crash occurred just after midnight.

A high-profile debate followed the crash, in which the need for laws relating to passenger and nighttime restrictions and driver training was the focus. Undoubtedly this debate was beneficial for road safety, in that it engaged a sometimes apathetic community, and ultimately led to what the NSW Government argues is a much improved Graduated Licensing Scheme (GLS); from 1 July 2007, new restrictions on novice drivers will include nighttime passenger restrictions, automatic loss of licence for speeding and a ban on mobile phone use.

However, at least one important aspect of road safety was conspicuous in its absence from this debate and subsequent policy initiative – roadside safety. While the fact that the car hit trees and an embankment was reported, little attention seemed to have been given to possibility that this might have been a contributing factor in the deaths. In terms of injury prevention, roadside safety was a potentially salient point; in terms of public debate it was trifling.

In fact an enormous number of road deaths occur each year when vehicles hit roadside objects like trees and poles: in Victoria, the figure is around 40%. And while the fact that a tree or pole was involved in a crash is often reported by the media, in many cases, it is the immediate behavioural causes of the crash which are the focus.

The question of whether the focus of road safety policy should be on the cause of crashes or the prevention of injuries goes to the heart of the safe systems approach – ultimately both aspects need to be addressed. While road safety debates and policy tend to focus on behavioural issues that are linked to the causes of crashes, like speeding, drink driving and distraction, they should also acknowledge the fact that mistakes, errors of judgment and poor driving decisions are normal human traits in motorists. Roads can be designed to cope with this.

It is not for a lack of technical expertise that run-off road deaths remain so prominent in crash statistics; we learned a long time ago how to make run-off road crashes survivable. There now needs to be a concerted effort to develop a debate within the community about the importance of roadside safety. Through AusRAP, AAA and its constituent motoring clubs have begun this process. In October 2006, we released the first road safety star ratings of the AusLink national network. RACV and RACWA also released star ratings for major state highways, and plans are in place to expand the star ratings in other states. The star ratings not only provide an overall assessment of safety, but also an assessment based on specific crash types, including run-off road crashes. The national results showed that just 57% of the AusLink network has safe roadsides.

The Federal Government has provided valuable financial support to AusRAP through the Australian Transport Bureau (ATSB). In its 2007–08 Federal Budget submission, AAA called on the government to use the AusRAP star ratings to complement the Black Spot program with a new, $400 million program to that proactively identifies and targets low-cost, high return priorities for the AusLink national network.

In particular, it is increasingly clear that, for any significant attempts to bring down the level of crash fatalities and serious injury, there needs to be a heightened focus on addressing roadside hazards. This is a challenge for all who want to see the NRSS target achieved – governments, the community and road safety bodies.

Retrospective on Road Safety Visits to Sweden and Ireland

by Graham Smith, Driver Training Centre, Gympie, Queensland

This is a shortened version of a talk presented at the December 2006 meeting of the Queensland Chapter of the College.

A visit to Europe in 2005 brought my wife Lyn and I into contact with a number of Road Safety practitioners. Out of these contacts came an invitation to visit Sweden to have a look at the "Vision Zero" concept. It also resulted in an invitation to present a paper and conduct a workshop at the *Vision in Vehicles* Conference in Dublin, Ireland, in July 2006. I have been a Senior Road Safety Educator at Roadcraft in Gympie, Queensland for more than 20 years. In common with all other educators in our organisation I work part-time. Roadcraft is a not-for-profit organisation started nearly 30 years ago by members of the local Rotary clubs with the help of other service organisations.

Road Safety in Sweden

My host in Sweden was Mr Thomas Lundgren of the Trafiksakerhets " Skid Training" Centre, at Gillinge, just outside Stockholm. We were joined for the day by Mr David Wilde from Vision Zero, which is a section of the Vagveket or Transport Department in Sweden.

Vision Zero

Vision Zero is an image of a future in which no person will be killed or seriously injured on Sweden's roads. It was ratified by the Swedish Parliament as a national policy in 1997. Vision Zero establishes that the loss of human life or suffering serious injury on the road is unacceptable. It recognises that there is no single factor that causes road crashes, therefore there is no single factor that will prevent road trauma. Vision Zero takes an integrated approach and considers that road safety education, road design and construction, vehicle design and law enforcement are all inter-related. Vision Zero requires thorough investigation into every crash that results in serious injury or fatality. These investigations must be carried out independently of any court of law or insurance consideration and must be carried out solely with the view of reducing death and injury.

Skid Training

Skid Training is one mandatory element of the licensing procedure in Sweden. A 4½ hour course is attended by every person before a driver's licence is granted. Eighteen years is the minimum age at which a person can hold a licence in Sweden. In practice, most young people do not receive a driving licence until they are between 19 and 20 years of age.

There are a number of Trafiksakerhets or Skid Centres in Sweden that are either privately or municipally owned. They are co-ordinated by the Transport Authority to ensure consistent presentations and outcomes. Each instructor teaches a class of 8 students using 4 cars. In-car activities are controlled by one-way radio broadcast and a remote control engine kill switch. A bitumen road circuit is used which contains a skid section covered by a plastic material that has the same frictional co-efficient as ice when it is kept wet. Sprinklers are used to wet the surface and are turned off as the participating car approaches the skid area. This allows clear vision during the skid sequence.

This training is orientated towards students experiencing a skid situation and its potential outcomes. The students are taught braking and energy concepts where the physics and dynamics of energy are thoroughly explained. They are also shown some crashed cars that have collided with and killed animals such as moose, wild boar and deer etc. The preserved bodies of these unfortunate animals are also displayed. These courses would serve to warn drivers to slow down where skids are likely but would do little to identify such danger areas or deal with a skid situation should it occur.

It is interesting to observe that many of my Australian road safety colleagues who speak against the concept of skid training often quote Sweden as being in the forefront of Road Safety, but omit any reference to skid training in that country. Perhaps we need to look to a third country, Canada, where I witnessed a skid training technique that would be very unlikely to psychologically stimulate the typical young " hoon" or be too challenging for the timid or over-cautious driver.

Vision in Vehicles Conference, Dublin, Ireland, July 2006

This conference, at which over 30 papers were presented, was the eleventh in a series of biennial meetings to foster research into the role of vision in the use of all vehicles across the transport sector. The presenters came from throughout the world, some from university research departments and some from vehicle manufacturers. I had been invited to present a paper and conduct a workshop on young drivers involved in motor vehicle crashes. In this paper I presented Roadcraft's history, educational philosophy and some of our teaching/ learning techniques.

I said that our responsibility is to identify and integrate physical, psychological and technical aspects of road use into driving in a manner that achieves safe, effective and responsible use of our roads. A shift in preconceived notions and sometimes archaic methodologies used by some road use educators is needed to bring road use and road safety into the forefront of all vehicle controllers minds, thus enabling a more harmonious union between all road users.

At Roadcraft we do not accept failure. Success is indicated by the level of intellectual and sensory learning of each and every individual who comes to Roadcraft and the extent to which it affects an attitudinal change that is paralleled by changes in their behaviours. These high expectations are often found daunting by new Road Safety Practitioners at Roadcraft. Only those instructors who are able to accept these high expectations, and can produce these outcomes, remain long-term educators at Roadcraft.

Vision Techniques have evolved over time that assist in developing dynamic vehicle understanding and use. Haptic, Visual and other Sensory information are integrated, developed and explained to our clients. This information is related to the development of real on-road defensive techniques. A number of theoretical and practical exercises have been instituted to assist our clients in becoming peripherally and primarily conscious of their vision capabilities.

The objective of these exercises is to foster in the student an understanding of the limitation of their vehicle and the effects of forces on them and their vehicle when driving. While this knowledge is being taught, vision and haptic skills are concurrently developed and practised. At all times our educators are required to make full use of the many opportunities such as emergency braking and steering incorporated into these activities, to effectively address the developing attitudes and aspirations of our participants. These experiences are designed to create a lasting effect in the minds of our drivers.

Evaluation of 'Roadcraft'

What I would like to achieve now is to have our work at Roadcraft researched and evaluated. A search of old papers from ACRS Journals revealed a draft policy entitled " Draft Policy Statement on Programme Evaluation" dated 23/8/90. There are two basic principles outlined in this policy statement. These are –

- The Principle of cost effectiveness
- The Principle of programme evaluation.The paper states that " It is the policy of the ACRS to support the principle of cost effectiveness and program evaluation in the assessment of all road safety proposals. This brings our request for research and evaluation or assessment of our Roadcraft programs firmly into the purview of ACRS Policy.

Improving Reversing Safety of Commercial Vehicles

By Dr Will Murray,
willmurray@roadrisk.net

Background

Insurance claims data from many companies around the world and research undertaken at the University of Huddersfield in the UK suggests that between a quarter to a third of all reported freight transport collision accidents arise from vehicles reversing, in some cases many more. Despite this, the vast majority of such accidents go unnoticed at the government and company levels. As a result there is only limited comparative data and, until recently, very few specific reversing-based reduction interventions such as vehicle-mounted safety cameras have been implemented by vehicle operators, driver trainers or policy makers.

Over 20 years ago, in 1982, the Health and Safety Executive (HSE) 'Transport Kills' document highlighted reversing as a manoeuvre responsible for a large proportion of fatal accidents in the UK. More recently, the HSE estimated that nearly 25% of all deaths involving vehicles at work occur while vehicles are reversing. The 25% figure comes from scrutiny of HSE inspectors' accident investigation reports, and includes approximately 10-20 deaths per annum. Vehicle direction is not always recorded, and HSE does not investigate all accidents reported to it – so the figures are possibly an underestimate.

A typical case, which recently went through the courts in the UK, involved a fatal reversing accident at the back door of a retail store. Approximately 38% of the company's vehicle accidents occur when their vehicles are reversing. The average cost of each accident is less than £500, mainly minor damage. Many such accidents never even get into most companies' insurance records, being dealt with as routine vehicle maintenance costs, let alone official UK statistics. For this reason companies and the authorities are often ignorant of the reversing risk until it is too late and someone has been killed or seriously injured. A range of recent research, management development and educational projects have shown that many vehicle operators keep very poor safety performance statistics and often only take safety seriously after a major accident.

In the case of the retailer discussed above, several reduction interventions, particularly improved site procedures and training, were implemented after the event! This case, and many others like it, show the importance of a proactive approach to reversing safety – and applying a range of appropriate management (eg analysis and review), site (eg risk assessment), driver (eg assessment and training) and vehicle-based (eg reversing cameras and alarms) interventions.

Proactive approach

The starting point for taking a proactive approach is to understand the extent of the reversing risk in your organisation. In a research project undertaken with over 50 companies, over 20% of the accidents involving artics, rigids, vans and fleets involved reversing. However, there was some variance in the data – with some van and rigid fleets being over 40%.

The research also analysed the locations where reversing accidents tend to take place for a typical retail multi-drop operation. 52% occurred at collection and delivery points, 4% at the company's own depot or recycling unit (RSU), 29% on site and 15% on route.

Based on the above discussion and data it appears that reversing safety should be addressed by a range of groups, including: vehicle operators, policy makers, researchers, health and safety specialists and driver trainers. Reversing safety improvements can be made in four main areas: management analysis, site procedures and operations, vehicles and people.

Performance review and improvement

We have recently developed a ‘ where are we now gap analysis’ or audit as the starting point to address the reversing safety issue. This provides a thorough understanding of the problem and allows decisions to be made on the most appropriate actions to take. The audit is reproduced in full below. The higher your score, the more safe systems of work you have in place for vehicle reversing. The lower your score, the more exposed you are to major reversing safety accidents, high costs and legal issues. It should be applied to the design of all new sites and operations and at existing sites on an annual basis.

The audit falls into four areas: operational analysis and statistics, site procedures and operations, vehicles and people. For each item you have in place – participants are asked to tick Yes. The percentage figures show how many of the first 50 participants had implemented each of the countermeasures, suggesting that some scope remains for the participants to improve their reversing safety performance.

Operational analysis and statistics	% Yes
1. Do you know your total number of vehicle accidents and % of accidents involving reversing by vehicle type?	83
2. Do you know the total number of reversing accidents at collection and delivery points, your own company sites and on the road?	70
3. Have you undertaken detailed data analysis on previous reversing accidents to identify causes?	48
4. Do you know the average cost of your reversing accidents?	46
5. Do you track the trend of reversing accidents by the categories shown in 1–4 above?	33
6. Have you identified all reversing operations?	72
7. Have you reduced the need for reversing wherever possible?	80
8. Have you minimised reversing distances?	43
9. Have you done reversing black spot analysis and risk assessments?	50
Site procedures and operations	
10. Have you undertaken site visits to improve delivery/collection points?	41
11. Have you made the delivery/collection points aware of the identified improvements?	28
12. Do you regularly consult employees (eg drivers) in the process of developing the layout of new sites?	50
13. Do you have a mechanism to allow drivers to make suggestions for improvements to existing sites?	80
14. Have you implemented procedures and safe systems of work?	87
15. Do your have a reversing checklist and procedures for new sites?	33
16. Do your sites clearly identify your reversing/people areas?	37
17. Have you assessed the quality of your lighting, visibility and mirrors?	78

Site procedures and operations continued	% Yes
18. Do you regularly improve yard and road layouts?	61
19. Do you regularly review the safety of yard ‘furniture’ (eg posts and pillars)?	76
20. Do you have one-way traffic systems at your sites?	50
21. Have you installed traffic light systems?	9
22. Have you implemented time bans to separate people and vehicles?	4
Vehicles	
23. Have you fitted/specified vehicle proximity devices?	89
24. Have you fitted/specified improved vehicle mirrors?	24
25. Have you fitted/specified auto reversing brakes/bumpers?	41
26. Have you fitted/specified flashing reversing lights?	28
27. Have you fitted/specified reversing bleepers/alarms?	9
28. Have you fitted/specified reversing cameras?	46
29. Have you fitted/specified any other reversing aids?	26
People	
30. Have you identified all people likely to be affected?	65
31. Do all your staff involved with vehicles reversing receive a copy of the HSE’s ‘Reversing Vehicles’ publication (11/95 ind (G) i48l c350 (free by calling 01787 – 881165)?	24
32. Are all drivers and banksmen properly assessed, trained and regularly reassessed? (eg seminars, video, data analysis feedback, poster campaigns, CD-ROM)	41
33. Do you exclude people from reversing areas?	72
34. Is a simple, agreed and clearly visible system of signalling and communication in place?	57
35. Do you regularly audit the management/supervision of reversing areas?	43
36. Do you issue fluorescent clothing to all relevant staff?	87
37. Do your drivers always check their mirrors are clean and correctly aligned and make sure that the reversing area is free of pedestrians?	98
38. Have you developed safe procedures/work instructions for all relevant staff?	87
39. Have you developed safe reversing procedures/work instructions for drivers?	48
40. Do you provide simple, but detailed, collection/delivery point details for drivers?	15
41. Do you provide guidelines/work instructions which visiting drivers must sign for and agree to adhere to when they arrive at your site?	35
42. Do you employ dedicated people as yard shunters/banksmen?	30
43. Do your banksmen receive and sign for a set of written procedures to which they must adhere?	76
44. Are your banksmen empowered to undertake regular risk assessments and feed the results back to their managers and supervisors?	74
Total (Of 44)	

More details about the audit, and an electronic copy, are available free from the author.

Policies of the Australasian College of Road Safety

By Ken Smith, ACRS Fellow

This is the second of a series of articles reviewing a further selection of the road safety policies previously approved at Annual General Meetings of the College. The aim of these articles is to give members the opportunity to read comments about the need for possible changes to the policies. Members are invited to send in comments to the Journal Editor (see address details inside the front cover).

Australian Road Laws

ACRS Policy Position

ACRS supports the introduction of the national road rules and road signs, on the grounds that a broad uniformity on the main issues reduces confusion and errors by drivers in unfamiliar surroundings. Measures to introduce uniform rules that have the effect of compromising safety in particular jurisdictions should not be supported.

Objective

The objective and guiding principle should be improved safety outcomes.

Discussion

The national road rules developed by the National Road Transport Commission have largely been implemented through State legislation.The main exceptions are the general urban speed limit*, on which jurisdictions are moving progressively and on which practice should be made uniform, rules on school zones, and novice driver licensing requirements, including licensing age. It has been agreed by Transport Ministers that novice driver licensing requirements are not part of the uniform package.

A national package of road rules assists ease of travel across jurisdictions, removes anomalies and confusion and has road safety benefits by removing one potential cause for crashes and ‘unintended’ violations.

It is not appropriate to pursue uniformity for its own sake: uniformity should be approached with the safety consequences in mind.

Comment

This is an example of a policy statement in serious need of updating. Also it differs from many others in that it was written to deal with an issue that with time has lost its importance. It was written at the time the national road rules were under debate, and the reasons for the reservations then expressed about ‘uniformity for its own sake’ are no longer relevant. Interestingly, some matters are still not uniform across Australia.

It is possible that this policy statement is no longer necessary at all, but this gives rise to an important principle. While there is now a uniform set of road rules across Australia, within those there remain differences in practice. Examples include some demerit point offences (outside a common ‘core’ set adopted by all jurisdictions), novice driver graduated licensing practices, school zone speed restrictions, compulsory carriage of driver's licence, enforcement practices and some others.

Are there issues of lack of uniformity that are still a problem? One of the prime reasons for seeking uniformity is to avoid the situation of drivers out of their home state being ‘ambushed’ by rules that do not apply in their own. There is also the principle that road users are expected to inform themselves of the rules that apply in jurisdictions in which they are operating (ignorance of the law is no excuse). Is it of concern to members that some matters are still not the same across Australia? Or are we content to accept some differences that reflect the socio-political history of different jurisdictions and simply say ‘vive la difference!’

We'd like to hear your views. Write or email to the ACRS Office.

Speed Management

ACRS Policy Position

ACRS supports zoning roads for speeds that are appropriate to road and road environment conditions. This entails the use of signs, engineering, education and enforcement. Correct speed zoning is rational and sends the ‘right’ messages to road users about the speeds at which they should travel in relation to road geometry and condition and the associated natural, built and human environment. Correct speed zoning encourages compliance with legal limits.

Speed zoning should be enforced using best practice: fairly, with clearly visible Police presence and media advertising.

Objective

To encourage drivers to travel at a speed appropriate to road and road environment conditions, to enhance safety, maintain road system service level and avoid detriment to persons in the immediate environment.

Discussion

Speed management refers to engineering, education and enforcement treatments to encourage road users to travel at a speed appropriate to road and road environment conditions. It can apply to urban and rural roads. The principal use of speed management is to discourage people from exceeding legal limits (since that is seen as the greatest speeding ‘problem’) but an objective may also be to discourage people from travelling so slowly as to impede other traffic.

Speed management consists of:

1. speed zoning roads and portions of roads according to horizontal and vertical alignment, natural and built environment and traffic conditions, to the most appropriate speed for those conditions, and signposting them accordingly;
2. where necessary providing traffic engineering measures to support the speed limit desired;
3. educating the public about the speed zoning principle and practice; and
4. enforcing the speed limits.

The use of speed zoning for managing vehicle speeds in urban areas is obvious. In rural areas speed zoning is used to manage speeds principally to suit terrain and road geometry. Thus instead of a general 100 km/h rural speed limit, limits would vary according to conditions. Minor or secondary roads in hilly country with narrow pavements and shoulders might be zoned as low as 70 or 80 km/h, in contrast to roads in open country in less populated areas that might be zoned at 100 or 110 km/h.

Speed zoning roads and sections of roads in this manner encourages drivers to believe that speed limits have a rational basis and are related directly to road and road environment conditions. Because of this, with appropriate education and enforcement, voluntary compliance with posted speed limits may be enhanced.

Comment

Speed zoning has been less discussed of late, but the principles still hold good. While there are some examples of speed zoning as described in this statement, there are many instances where work still needs to be done. The most notable and most frequent example is a blanket 100 km/h applied to rural single carriageway roads, in open, favourable terrain as in hilly, windy roads with poor surface, narrow or nonexistent paved shoulders and poor sight distances. Increasingly, speed limits especially in rural areas should be set with reference to the degree to which road reserves and medians are forgiving of the errant driver, nothwithstanding the quality, width and curvature of the road pavement.

Another problem is where speed zoning is applied according to these criteria, there are relatively frequent changes in speed limit to reflect the changes road geometry. This has led to complaints by the motoring public of too-frequent changes in speed limit. This appears to occur because road authorities have failed to take the simple measure of adequately publicising the reason for the speed limit changes and why. Road authorities do themselves no good for this failure.

The criteria applied to zone roads and streets themselves create anomalies in places. Residences and businesses fronting direct onto a feeder road (as distinct from a local street) dictate a speed limit of 60 km/h, but where, for example, a street has two travelling lanes and a parking lane on either side of a wide central median, the subconscious message to road users is more likely to suggest 80 km/h as for an arterial than the posted and appropriate 60 km/h. Good signposting and perhaps also better promulgation to road users of the rationale for speed zoning is necessary to ensure drivers are not ‘trapped’ by some aspects of the road environment without realising the significance of other components.

Another kind of anomaly frequently occurs because road authorities usually do not speed zone lengths of road less than one kilometre. This can lead to anomalies if changes in land use occur in less than that distance.

There remains ‘unfinished business’ in this policy area.

50 km/h General Urban Speed Limit

ACRS Policy Position

ACRS supports a general urban speed limit of 50 km/h. ACRS supports this measure both because of safety benefits and because it represents best practice of the majority of developed motorised nations. However, Australian jurisdictions that have adopted or permitted the application of a 50 km/h urban speed limit have not done so in a uniform manner. ACRS supports 50 km/h as the *default general urban speed limit.*

In practice the limit of 50 km/h would only apply in residential streets. ‘Special’ areas such as school zones and the like could be zoned to lower speeds; feeder and arterial roads and freeways with main functions other than residence or retail/commercial and not involving significant pedestrian movement may be zoned to higher limits, much as is the case at present in many urban areas. But such zoning must be done according to a uniform and rational set of principles or warrants and be applicable across Australia

Australian Transport Council voted in November 1996 to retain the present general urban speed limit of 60 km/h in the national road rules, at least for the time being.

The Australian College of Road Safety is disappointed in this decision given the safety benefits to be expected from the lower urban speed limit and already realised in Victoria, Queensland and WA, and a wide measure of public support. ACRS commends efforts of jurisdictions to move toward 50 km/h, but urges that uniform practice and application be adopted.

Objective

To improve the safety of urban areas in Australia, especially for pedestrians and unprotected road users.

Discussion

Speed limits are the one road safety measure that reduces both the frequency of road crashes and the severity of road trauma. By far the majority of developed motorised nations have a general urban speed limit of 50 km/h (or 30 mph). There is a body of research evidence that shows that a reduction of 10 km/h in vehicle speeds can make a significant difference to the incidence and severity of pedestrian injuries. An Australian experimental study [Kloeden et al, 1997] demonstrated that a car braking from 50 km/h stopped short of an obstacle that it struck at a speed of approximately 25 km/h when braking from a speed of 60 km/h.

It is an integral part of the policy that a general urban speed limit of 50 km/h goes in hand with a system of speed zoning of urban roads according to function (see separate policy statement on Speed Management). Feeder and arterial roads would be zoned at speeds that reflect their function, and probably at much the same limits as at present.

The 50 km/h limit will be the general limit for all urban areas, with streets and roads zoned above and below 50 km/h as appropriate If 50 km/h is the ‘ default’ limit for urban areas, roads with a different limit will be signposted. This is the College's preferred position.

A general urban speed limit of 50 km/h has many benefits and few disadvantages. The main benefit is the safety improvement that is the main reason for encouraging lower urban speeds. Lower emissions and fuel consumption may also result.

One obvious and possible disadvantage is lengthening of travel times. An Austroads study [ref] has demonstrated that the increase in travel time would be negligible, since the lower speed limit would not apply to that part of urban travel that is on arterial roads and freeways.

In addition there are implementation costs (signs and markings, publicity and education) and the need for enforcement to increase compliance with the changed speed limits.

Reference

Kloeden CN, McLean AJ Moore VM and Ponte G (1997) *Travelling speed and the risk of crash involvement*, CR172, FORS Canberra

Comment

This policy statement was developed when the 50 km/h speed limit issue was still under debate and not yet accepted everywhere. This has now occurred, with the Australian Transport Council now having agreed to adopt 50 km/h as the default general urban speed limit. All jurisdictions have now adopted it.

The policy statement should now be amended to reflect the current position. It still serves a purpose to members and readers, however because it explains the rationale for speed zoning in urban areas, which we believe is still not well understood in the community.

Now that 50 km/h is established we might well consider whether there is merit in following practice overseas, particularly in Europe, in a further step. Frequently local streets in residential precincts where there is shared use have limits of 40 or even 30 km/h. This reflects the use of such streets as a general community resource rather than solely for motor traffic. Modern urban design practice in Australia increasingly leans towards curved, low speed residential streets and cul-de-sacs fed by feeders to arterials rather than the older grid patterns. ACRS members may wish to consider whether the College should now consider promoting the idea of lower speed limits in residential precincts.

Peer Reviewed Papers

Effects on Driving Performance of In-Vehicle Intelligent Transport Systems: Final Results of the Australian TAC SafeCar Project

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This paper was originally presented at the November 2005 Australasian Road Safety Research, Policing and Education Conference in Wellington, New Zealand.

Abstract

This paper reports the final outcomes of a large six-year collaborative research and development project undertaken by the Monash University Accident Research Centre, in conjunction with the Victorian Transport Accident Commission (TAC) and Ford Australia. The TAC SafeCar project, as it has become known internationally, was designed to evaluate, in an on-road trial, driver interaction with three in-vehicle Intelligent Transport Systems: Intelligent Speed Adaptation (ISA); Following Distance Warning (FDW); and the Seat Belt Reminder (SBR). The technical operation of the technologies, driver acceptance of them, and their effects on driving performance and safety were evaluated. These systems, along with a Reverse Collision Warning (RCW) system and Daytime Running Lights, were equipped to 15 Ford passenger cars sub-leased to several Government and private organisations in Melbourne, Australia. A total of 23 drivers drove a SafeCar for 16,500km. The study is the first to have examined the interactive effects of ISA and FDW systems, and the first to have examined long-term driver adaptation to FDW and SBR systems. In this paper, the overall effects of the systems on driving performance and safety are reported. In a companion paper, findings pertaining to driver acceptance of the systems are presented.

Introduction

Intelligent Transport Systems (ITS) have significant potential to enhance traffic safety [1,2]. The term ITS refers to integrated applications, employing combinations of information, communications, computing, sensor and control technologies, which aim to improve transport safety and mobility and reduce vehicle emissions. Many such technologies have been developed to enhance vehicle safety: to prevent crashes, reduce trauma during a crash or to reduce trauma following a crash (see [1] for a review). Currently, however, there is very little consumer demand for such systems. There are several reasons for this. First, most consumers are unaware that such technologies exist: if they do not know that they exist, they will not demand to have them. Second, at their present state of technical maturity and level of deployment, most are too expensive for purchase by the average consumer. Third, there will be no demand for in-vehicle ITS applications unless vehicle manufacturers and consumers judge them to be safe, reliable, useful, easy to use, and affordable. Unfortunately, the long-term safety benefits of most vehicle ITS applications are not well understood. The systems have not been deployed for long enough and in large enough numbers in traffic for crash numbers to be a reliable indicator of changes in safety [2].

Against this backdrop, the Transport Accident Commission (TAC) commissioned the Monash University Accident Research Centre (MUARC) in June 1999 to undertake what has become known internationally as the *TAC SafeCar* project. In addition to the key project partners – the TAC, MUARC and Ford Australia – more than a dozen other organisations provided technical input to the project. The aim of the project was to evaluate the technical operation of a small selection of ITS technologies with significant potential to enhance driver safety, to assess the acceptability of these to drivers, and to evaluate the impact of these technologies on driver performance and safety, both on the road and in an advanced driving simulator. The ultimate aim of the project was, through demonstration and quantification of the benefits deriving from the systems, to stimulate community demand for them in Victoria, and more broadly within Australia.

The TAC SafeCar project was conducted in four phases. Phase 1 culminated in the selection of several in-vehicle ITS technologies that were estimated to have the potential to significantly reduce road trauma in Victoria. Phase 2 involved the development of functional and Human-Machine Interface (HMI) specifications for these systems, the purchase and/or development of them, the fitment of them to two Ford demonstration vehicles, and testing of the technologies for usability and reliability. In Phase 3, 15 Ford passenger cars were equipped with four ITS technologies: Intelligent Speed Adaptation (ISA); Following Distance Warning (FDW); Seat Belt Reminder (SBR); and Reverse Collision Warning (RCW). During this Phase, the systems were also tested for acceptance against the original specifications. In Phase 4, a field evaluation of all four technologies as well as a simulator evaluation of two variants of the ISA system were conducted. The purpose of the field evaluation was to assess the technical operation of the ITS technologies, evaluate driver acceptance of them, and investigate the separate and combined effects of the technologies on driving performance and safety.

The TAC SafeCar study is unique. It is the first study, known to the authors, to have systematically examined the interactive effects on driving performance of ISA in conjunction with other ITS technologies. It is also the first study to have examined the effects on driving performance and behaviour of long-term exposure to Seatbelt Reminder and FDW systems. This paper reports the final outcomes of the Phase 4 field evaluation, which is the culmination of six years of collaborative research and development activity. A paper presented at this conference last year contained preliminary findings from the field trial for 8 Treatment drivers only. The present paper reports final results for all Treatment and Control drivers, a greater number of key performance measures and crash and trauma reduction estimates. A companion paper, that reports findings pertaining to driver acceptance of the technologies deployed in the field evaluation, can be found in the current conference proceedings [3].

Safecar Its Technologies

As noted above, fifteen Ford sedans and wagons, sub-leased by 9 government and private companies in Melbourne, Australia, were each fitted with the following ITS technologies: Intelligent Speed Adaptation; Following Distance Warning; a Seat Belt Reminder; and Reverse Collision Warning. These systems were designed to automatically issue warnings to the driver only if they violated certain road rules, undertook certain high-risk driving behaviours, or were in danger of colliding with an object or vehicle when reversing. Briefly, the ISA system was designed to warn the driver when he/she was travelling 2 km/h or more over the posted speed limit. A visual warning was issued via an ITS visual warning display mounted on the dashboard, and this was accompanied by a short duration auditory signal and continuous upward pressure on the accelerator pedal. The FDW system was designed to warn the driver if he/she was following too closely the vehicle immediately in front. There were six levels of visual warning, displayed on the ITS visual warning display, which increased in intensity as following distance decreased. The final visual warning was accompanied by a repetitive auditory warning. The SBR system issued visual warnings via the ITS visual warning display when it sensed that any vehicle occupant was unrestrained, and issued progressively more intense auditory warnings at speeds greater than

10 km/hr. Finally, the RCW system was a reversing aid that warned the driver if he/she was about to collide with an object to the rear of the vehicle. The repetition rate of the auditory warnings became more rapid as the distance between the vehicle's rear and the object decreased. The test vehicles were fitted with a number of additional systems to support the on-road study. These included: a System Override Button and a Data Logging System. For a more detailed description of these systems, the reader is referred to a paper by [4].

Study Design

Each of 23 drivers drove one of the SafeCar vehicles over a distance of 16,500 kilometres. Of these participants, 8 (7 males and 1 female) were assigned to a control group and 15 (14 males and 1 female) to a treatment group. Drivers were aged between 29 and 59 years, with a mean age of 43.4 years. Participants were recruited from Government and private companies in and around Melbourne.

For the purposes of the field trial, the four ITS technologies in the experimental vehicles were divided into two groups: "key" systems and "background" systems. The key systems, ISA and FDW, were the SafeCar ITS technologies that were of primary interest in the study. The background systems were SBR, and RCW. The Treatment participants were exposed to the key and background systems, while the Control participants were exposed to the background systems only.

The Treatment participants were not exposed to all four ITS technologies for the entire length of their trial. The ITS systems turned on and off at predetermined points in the trial, in order to assess the effects of each system on driving performance before, during and after exposure to them. The Treatment participants' trial was divided into a number of periods: the "Familiarisation", "Before", "During" and "After" periods, as depicted in Figure 1.

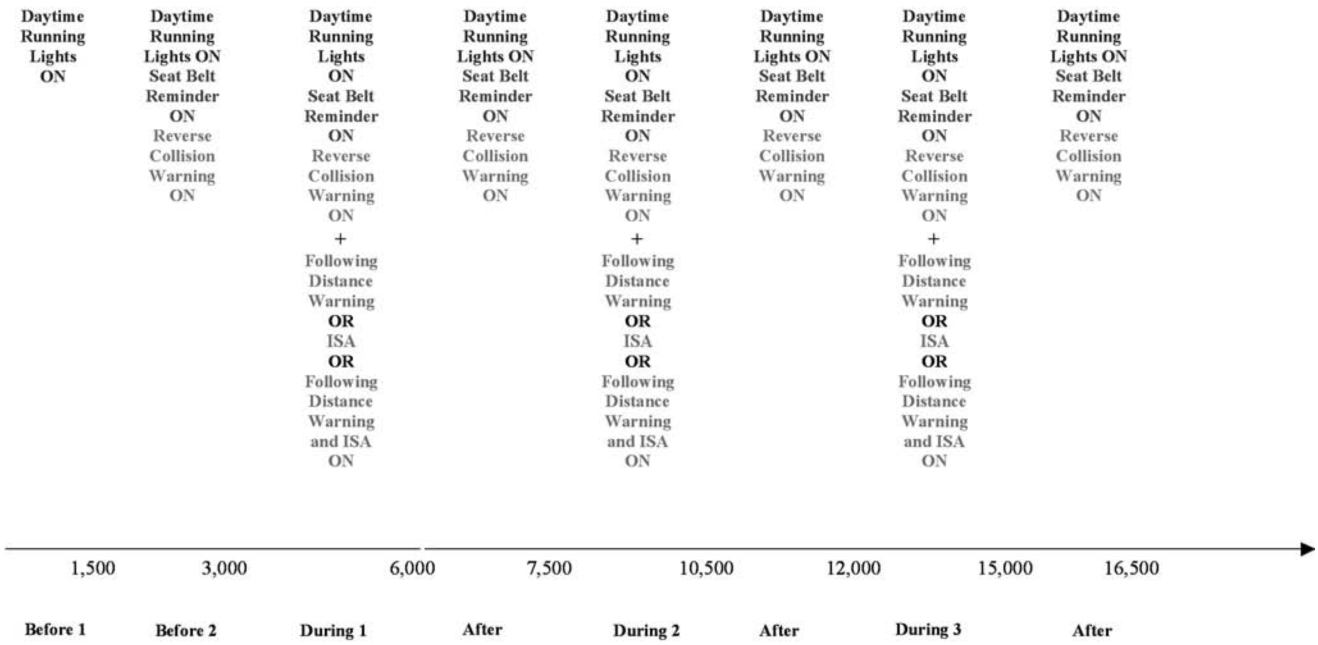

Figure 1: Treatment Group Design Sequence

The Familiarisation period lasted for 200 kilometers and provided drivers with the opportunity to familiarize themselves with the SafeCar before any ITS technologies were activated. Participants then completed the Before 1 period, which lasted for 1,500 kilometers. During this period, baseline performance data were collected and, hence, no ITS system warnings were issued. The data logger, which records a range of driving performance data, was first activated during this period and remained on for the rest of the trial. Next was the Before 2 period, which lasted for 1,500 kilometers. In the Before 2 period the RCW and SBR systems were activated and these systems remained on for the rest of the trial.

The During periods were designed to assess the effect on driving performance of the ISA and FDW technologies in the SafeCars. The During periods were divided into " During 1, 2 and 3" periods, and each lasted for 3,000 kilometers. The During 1 period occurred immediately after the Before 2 period. In addition to the RCW and SBR systems, in the During period drivers received warnings from the ISA, FDW system, or both systems concurrently. The system or system combination received in each During period was counterbalanced across drivers to control for order effects. Each During period was followed by a 1,500 kilometer " After" period in which the system(s) that was active in the previous During period was switched off.

The control participants' trial was divided into two periods: the Control 1 and the Control 2 periods. The Control 1 period was equivalent to the Before 1 period experienced by the treatment participants. During the Control 2 period, which lasted for the remainder of the trial (15,000 kilometers), the SBR and RCW systems were active.

Results

This paper presents the key findings that emerged from the field trial. The findings derive from analysis of the logged driving data only. The key findings deriving from the ISA, FDW and SBR systems are summarised below. The effect of the RCW on driving behaviour was not evaluated. Developed for commercial rather than research purposes, there were several vagaries in the data generated by the RCW. For this reason the data from the RCW system were not logged during the study.

The analyses were performed on data aggregated across the 15 treatment drivers and 8 control drivers. As each treatment driver received the ISA and FDW systems, separately and together - in different orders - it was necessary to present the data separately for the ISA, FDW, and ISA and FDW combined driving periods to avoid inferring that all drivers received the same system in each of the three During periods. In each case, data is presented for the following periods: the Before 1 period; the ISA, FDW or ISA & FDW *'Before'* period, which corresponds to the period directly before drivers received a particular system(s); the ISA, FDW or ISA & FDW *'During'* period, which corresponds to the During period in which a particular system(s) was activated; and the ISA, FDW or ISA & FDW *'After'* period, in which the system(s) that was active in the previous During period was switched off.

Prior to conducting the analyses, the data were screened to ensure the assumptions of the analyses were met. Inspection of the ISA, FDW and SBR data revealed that the data were normally distributed and no extreme univariate outliers were present. Variables which contained missing values were excluded from the analyses.

Intelligent Speed Adaptation

A series of analyses (t-tests and ANOVAs) was conducted on the speed data to examine if use of the ISA system, alone and combined with FDW, influenced mean and 85th percentile speeds, standard deviation (SD) of speed, percentage of time spent above the speed limit and mean trip time. These analyses were performed separately for five speed zones (50, 60, 70, 80 and 100 km/h roads) and only data for " free" speeds (i.e., when the time headway between the SafeCar and a vehicle in front was 3 seconds or more) were examined. [Traditionally, it has been reported (e.g., [5]) that, at time headways of about 3 seconds or greater, the speed at which a driver chooses to travel is not influenced by the vehicle ahead, although some (e.g., [6]) have argued that the speeds of two vehicles are linearly dependent for time headways up to 6 seconds. In conducting these analyses in was noted that were no major differences in variability across the variables and conditions examined.

Both ISA alone and ISA and FDW were effective in reducing the treatment drivers' mean speed, with the combined systems leading to the greatest speed reductions. When ISA was active alone mean speeds reduced significantly (by up to 1.4 km/h) in the 60 and 100 km/h speed zones ($p < .05$). Mean speeds also reduced significantly (by up to 1.5 km/h) in all but the 100 km/h speed zones when both ISA and FDW were active ($p < .05$). When the ISA system was disengaged in the After period, however, mean speeds increased significantly again in most speed zones, implying that most of the speed reduction benefit from the ISA system was obtained only while the system was active. Use of the FDW system alone had little or no effect in reducing mean speed in the speed zones examined. Finally, comparable reductions in mean speeds across the control drivers' trial were not found, suggesting that the reductions in speed for the treatment drivers were due to the effect of the ITS systems and not to other, uncontrolled, variables.

Interestingly, the ISA system was more effective in reducing higher speeds, such as 85th percentile speed, than in reducing mean speed. Both ISA alone and ISA and FDW combined were effective in reducing the treatment drivers' 85th percentile of speed, with the combined systems again leading to the greatest reductions. When ISA alone was active, 85th percentile speed reduced significantly (by up to 2.7 km/h) in 50, 60, 70 and 100km/h zones ($p < .05$). When the ISA and FDW systems combined were active, 85th percentile speed reduced significantly (by up to 3.0 km/h) in 50, 60 and 70 km/h zones ($p < .05$). However, when the ISA system was deactivated in the After period, the 85th percentile of speed increased significantly again in most speed zones. As was the case with mean speed, no corresponding reduction in 85th percentile speed was evident across the control drivers' trial, indicating that the observed speed reductions were due to the effect of the SafeCar systems and not to other, uncontrolled variables.

ISA alone and ISA combined with FDW were very effective in reducing the proportion of time treatment drivers spent, relative to the control drivers, travelling at and above the speed limit in all speed zones examined. When the ISA system was active, the drivers spent 57 percent less time driving 10 km/h or more above the speed limit, compared to before the ISA system was active. When ISA and FDW combined were active, treatment drivers spent 65 percent less time driving 10 km/h or more above the speed limit.

For the treatment drivers, a significant reduction of up to 1.1 km/h in the standard deviation of speed was observed when the ISA system was active (alone and in combination with the FDW system) and this pattern was consistent across all speed zones examined ($p < .05$). The standard deviation of speed after the ISA system was switched off was only slightly lower than that recorded before the system was activated; again implying that most of the benefit from the ISA system was obtained while the system was active.

Finally, mean travel time (in minutes) was examined in order to determine if the use of ISA increased the average time taken to complete commuter trips. A commuter trip was defined as any trip longer than 1 minute that was started and completed within the time period specified by each participant as the period in which they most often travel to and from work. Hence, mean travel times were based largely on common routes. ISA, by itself or in combination with FDW, did not significantly increase the treatment drivers' mean trip time. In fact there was a trend for mean trip time to decrease slightly when ISA alone and FDW alone were active. This is an encouraging finding, as it indicates that, although the treatment drivers' mean speeds were lower while the ISA system was active, these reductions in speed did not translate into an appreciable increase in trip time. Presumably, this is because there was less variability in their speeds during these periods. No corresponding decrease in speed variability was observed for the control drivers.

Following Distance Warning

A series of analyses (t-tests and ANOVAs) was conducted on the following distance data to examine if use of the FDW system, alone and combined with ISA, influenced mean time headway, the standard deviation of time headway and the percentage of time spent at time headways below 0.8 seconds. Time headway is defined as the distance in meters from a vehicle ahead divided by speed in meters per second. These analyses were performed separately for four speed zones (50, 60, 80 and 100 km/h zones). Examination of the underlying following distance distributions suggested that the change in performance was primarily reflected in a shift to longer following distances rather than a change in the shape of the distribution.

The FDW system, when active alone and when combined with ISA, was effective in increasing the treatment drivers' mean time headway. These increases occurred in all speed zones, but were significant only in 60, 80 and 100km/h zones. When

FDW alone was active, mean time headway increased significantly in 80 and 100 km/h speed zones (increases of 0.10, and 0.11 seconds, respectively), while for the combined FDW and ISA system, significant increases occurred in 60, 80 and 100km/h speed zones (increases of 0.09, 0.07 and 0.13 seconds, respectively) ($p < .05$). No corresponding increases in mean time headway were evident across the control drivers' trial. It is also interesting to note that, in contrast to the speed data, which found that ISA was more effective in reducing speeds when combined with the FDW system, the FDW system was no more effective at increasing following distance when it was combined with ISA, than when the FDW system alone was active.

The percentage of time treatment drivers spent driving in each of three time headway categories was examined immediately before, during and after exposure to the FDW system: 0 seconds to approximately 0.8 seconds; 0.8 to 1.6 seconds and 1.6 to 2.5 seconds. Investigating these three time headway categories allowed for the examination of the effect of the auditory and visual FDW warnings on following behaviour, as well as the identification of any negative adaptation to the system, whereby drivers spend less time at higher headways outside of the FDW warning range (above 1.6 seconds). When the FDW system was active, on its own or jointly with ISA, the treatment drivers tended to spend a smaller percentage of their driving time (a reduction of as much as 69% – from 6.1% to 1.2%) at headways below 0.8 secs, compared to the Before period. However, this effect was not significant in any of the speed zones examined due to large variability in the data ($p > .05$). The presence of the FDW system also did not significantly influence the percentage of time spent at time headways between 0.8 to 1.6and 1.6 to 2.5 seconds. Although not statistically significant, the effects of the FDW system on time headway were quite large in descriptive terms and, if reliable, could have a substantial impact on crashes.

When the FDW system on its own, or when combined with ISA, was activated, the standard deviation of time headway reduced significantly by 0.03 seconds, but only in 50 km/h speed zones ($p<.05$). However, no significant differences in the standard deviation of time headway were found for the other three speed zones examined.

Finally, although there was a trend for the minimum time headway reached per trip to increase in all speed zones when the FDW system (alone or combined with ISA) was active, these reductions were not significant in any speed zone.

Seatbelt Reminder Warning

A series of analyses (t-tests and ANOVAs) was conducted on the seatbelt data to examine if use of the SBR system influenced the percentage of trips driven where an occupant was unbelted for any part of the trip, in the percentage of total driving time spent unbelted, in the time taken to fasten a seat belt in response to the SBR warnings and the average speed reached before buckling up. The analyses were conducted on data collected in all speed zones, when the SafeCar was travelling at speeds of 10 km/h and more. The SBR analyses were conducted for the treatment and control drivers as a whole, given that both groups of drivers were exposed to the SBR system for the same number of kilometres (15,000 kms) and for the same driving periods. The SBR system used was unable to determine whether the changes in seat belt wearing behaviours described below pertain to the SafeCar drivers or to their passengers.

Prior to interacting with the SBR system, SafeCar occupants were unrestrained during any part of a trip on 32 percent of trips they undertook. In the Before 2 period, when the SBR system was activated, this percentage reduced to 16 percent, representing a 48 percent reduction, which was significant ($p < .05$). This reduction was maintained for the remainder of the trial, although there was a trend for the percentage of unbuckled trips to increase slightly again over the duration of the trial.

The percentage of travel time where an occupant was unrestrained also decreased significantly in the Before 2 period when the SBR system was first activated. Before the SBR system was active, about 5 percent of the distance travelled by SafeCars was undertaken with an occupant unrestrained. After activation of the system, this figure decreased significantly to 0.18 percent, a reduction of 96 percent ($p < .05$). This reduction was maintained for the remainder of the trial, although there was a trend for the percentage of driving distance spent unbuckled to slightly increase again over the duration of the trial, to about 0.31 percent by the end of the trial. Nonetheless, this percentage was still significantly lower than at the beginning of the trial, before the SBR system was activated.

Prior to activation of the warnings, it took unbelted occupants 30 seconds, on average, to buckle up. This reduced significantly to an average of 7 seconds in the Before 2 period when the SBR system was activated, which equated to a 77 percent reduction. This was maintained for the remainder of the trial and the time taken to buckle up was significantly lower at the end of the trial than at the beginning.

The peak speed reached when any of the vehicle occupants were unbuckled was also examined across the trial. Prior to activation of the SBR system, the peak speed reached before all vehicle occupants buckled up was 33.5 km/h. This reduced significantly to 26.9 km/h in the Before 2 period, when the system was activated, equating to a 20 percent reduction in peak speed ($p < .05$). This reduction was maintained for the remainder of the trial.

The proportion of time spent driving at " dangerous" speeds while a SafeCar occupant was unbuckled (defined as 40 km/h and over) was also examined across the trial periods. Whilst travelling unbuckled at any speed is considered dangerous, a threshold of 40 km/h was chosen as a " dangerous" forward moving speed to be travelling at while unbuckled because the risk to occupants of being fatally or seriously injured in a crash while driving unbuckled at this speed or higher is four times higher than the risk of a restrained occupant being killed or seriously injured at 40 km/h (Evans, 1996). Before activation of the SBR system, the percentage of driving time spent unbuckled while travelling at dangerous speeds was 6.72 percent. This reduced significantly to 0.05 percent in the Before 2 period, when the SBR system was activated, representing a 99.99 percent reduction in the percentage of time unbuckled ($p < .05$). This reduction was maintained for the remainder of the trial.

Crash and Trauma Reduction Estimates

Preliminary estimates of the benefits likely to be derived from wide-scale deployment of these systems have been derived. For the ISA system, the Power Model developed by Nilsson (2004) was employed to estimate the reductions expected in injury and fatal crashes based on the decreases in mean speed observed when the ISA system was active. Based on the observed reductions in mean speed, the ISA system on its own is estimated to reduce fatal and serious injury crashes by up to 9 and 7 percent, respectively. When operating in tandem with the FDW system, the benefits are greater. Further modelling, which takes account of the significant truncation by ISA of peak speeds, is likely to yield greater crash and trauma reduction benefits for this system. For the FDW system, the expected reductions in those driving instances during which a collision with the lead vehicle would occur if the lead vehicle suddenly braked (termed rear-end collision mode) were modelled based on the observed increases in time headway when the FDW system was active. Based on this model, the percentage of driving distance spent in rear-end collision mode (that is, where the vehicle would collide with the lead vehicle if it braked suddenly) is expected to reduce by up to 34 percent when the system is active and when the lead vehicle is braking at a moderate rate. Estimates of the cost savings expected from the use of the SafeCar SBR system were calculated by first determining the cost of unrestrained occupants in Australia and, second, the cost savings associated with seat belt use. Cost savings associated with seatbelt wearing were calculated by using HARM, which quantifies injury costs from road trauma. Use of the SBR system is expected to save the Australian community approximately $335 million per annum in injury costs.

Discussion and Conclusion

Overall, the ISA, FDW and SBR systems had a positive effect on safe driving performance. Interestingly, ISA was effective in reducing mean speeds, and even more so in reducing speeds at the higher end of the distribution, such as 85^{th} percentile speeds. Statistically significant reductions in mean speeds deriving from use of the ISA system tended to be in the order of 1 to 2 km/h depending on the speed zone, which is lower than the 5 km/h reductions in mean speed found in previous ISA evaluations [7-10]. From an examination of the distributions, it appears that the use of ISA truncates both ends of the speed distribution, such that higher speeds are greatly reduced and lower speeds are slightly increased (e.g., drivers spend less time driving at speeds well below the speed limit), resulting in relatively small reductions in mean speed. This finding is supported by the speed variability data, which showed that speed was less variable when the ISA system was active. Another explanation why the mean speed reductions found in the current study were lower than that found in other studies is that during the trial a speed enforcement campaign was implemented in Victoria which led to population-wide reductions in mean speeds. These reduced mean speeds were, in fact, evident in the control drivers' speed data. It is possible that these overall reductions in speed, combined with a relatively conservative sample of drivers, attenuated the full potential effects of the ISA system. It is also possible that the definition of "free" speed adopted in this study (speed was defined as being free when the time headway between the SafeCar and a vehicle in front was 3 seconds or more) may have been too conservative. Re-analysis of the ISA data for free speeds that are defined as vehicle speeds at inter-vehicle time headways of 6 seconds or more [6] may yield even greater effects.

The ISA system appeared to be most effective in reducing speeding when combined with the FDW system. One reason that the combined systems had a greater effect on speed may be because the expected driver response to the FDW warnings is to slow down temporarily to increase the distance from the vehicle ahead, which would have further decreased mean speeds. Another explanation of why both systems combined had a greater effect on speed may simply be the result of the drivers receiving warnings from more than one system in a driving period, which provided them with extra incentive to drive in a safer manner.

The current study is the first to examine long-term adaptation (over 6000 km of driving) to a FDW system. Previously, adaptation to a laser-based headway detection device has been examined over relatively shorter distances (e.g., 110 km) [11]. Use of the FDW system significantly increased mean time headway and reduced time headway variability. In addition, although not statistically significant, there was a strong trend for the percentage of time spent at time headways at or below 0.8 seconds to decrease when the FDW system was active. Indeed, drivers spent up to 69 percent less time at headways at or below 0.8 seconds when the FDW system was active which, although not statistically significant, may have large crash reduction benefits. This finding is consistent with the Ben-Yaacov et al [11] study, in which it was found that the following distance warning system was effective in encouraging drivers to spend less time at shorter, unsafe, time headways. In contrast to the speed data, the FDW system, when combined with ISA, was as effective in increasing following distance as when the FDW system alone was active.

A consistent finding was that the positive effects on speeding and following behaviour induced by the ISA and FDW systems did not persist when the systems were deactivated in the After periods. Indeed, driving performance after system activation was similar to performance prior to system activation. Such evidence that safe driving behaviours are not sustained once the systems are switched off indicates the importance of drivers having permanent exposure to these safe driving technologies.

The current study is also the first to examine long-term adaptation to a SBR system; indeed, it is the only study known to the authors to have quantified the effects on seatbelt wearing performance of interaction with a SBR system. The findings revealed that driver interaction with the SBR system led to large decreases in the percentage of trips driven where an occupant was unbelted for any part of the trip, in the percentage of total driving time spent unbelted, in the time taken to fasten a seat belt in response to the SBR warnings and in the average speed reached before occupants buckled up. These results occurred even though the initial seatbelt wearing compliance rates, at least for drivers, were reportedly high, suggesting that the SBR system can be effective in further improving seatbelt compliance among occupants who already have high wearing rates.

Finally, over the course of the trial, there was very little evidence of " negative behavioural adaptation" to the systems, by either the treatment or control drivers. That is, drivers engaged very little, if any, in compensatory risk taking behaviours in response to the assistance provided by the SafeCar systems. There was one minor exception. As already noted, some treatment drivers tended to spend less time driving at speeds well below the speed limit, presumably as a result of driving to the ISA warnings; that is, increasing speed until warnings were issued.

The findings yielded in this study were very positive, especially when considering that the treatment drivers were generally conservative drivers and that they were constantly aware that their driving performance was being closely monitored. It is therefore probable that the positive results observed would be even greater in the general driving community under normal driving conditions. Furthermore, it is expected that the magnitude of the results would have been larger if the trial had taken place at a time when general speed levels in Victoria were not simultaneously decreasing.

Although the final outcomes from the SafeCar study are yet to be fully disseminated, the project has already had an impact, directly and indirectly, on ITS developments in Australia and overseas. Two ITS technologies, seatbelt reminder and reverse collision warning systems, are now fitted to Ford BA Falcons and Territory models in Australia. The project has attracted a large amount of publicity in Australia and overseas, raising community awareness of the safety potential of the SafeCar systems. Reference to the project is made in a number of Australian and overseas Government transport policy documents and the project has spawned a large and expanding ITS research program at MUARC. Learnings from the project have informed the design of international ergonomic standards for the design of vehicle cockpit systems. The project has provided local industry in Melbourne with expertise and knowledge in developing ITS related systems. Finally, at least one government authority in Victoria has installed on several of its fleet vehicles an ISA system functionally similar to that in the SafeCars.

On the basis of findings reported here, the authors believe a strong case can be made for the wide-scale deployment of ITS technologies, in-particular ISA and SBR systems. In the final report on the SafeCar project, many recommendations are made by the authors: for implementing wider-scale deployment of these systems; for the technical refinement of the systems; for dissemination of the findings from the study; for future research; and for further optimisation of the human-machine interfaces for the SafeCar systems.

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The Effect on Driver Workload, Attitudes and Acceptability of In-Vehicle Intelligent Transport Systems: Selected Final results from the TAC SafeCar project

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Abstract

As part of the Australian TAC SafeCar on-road study, 15 Ford vehicles were equipped with Intelligent Speed Adaptation (ISA), Following Distance Warning (FDW), Reverse Collision Warning (RCW), and Seat Belt Reminder (SBR) systems. The primary aim of the study was to assess whether long-term exposure to these systems leads to a change in measurable driving performance. As a supplement to the objective measurements of driving performance, a series of questionnaires was administered throughout the study to collect subjective data. These questionnaires were designed to evaluate:

1. changes in driver attitudes attributable to ITS exposure;
2. the effect of the ITS on the workload drivers experience while performing certain driving tasks; and
3. the acceptability of the ITS, in terms of usefulness, effectiveness, social acceptability, affordability and usability.

Twenty-three drivers were recruited to participate in the study and each drove one of the ITS equipped cars for 16,500km. The purpose of the current paper is to report a selection of the more interesting results from the subjective data collected in the TAC SafeCar on-road study. Potential barriers to uptake and acceptance of the various ITS are discussed. The final results pertaining to the effects of the SafeCar technologies on driving performance are reported in a companion paper presented at this conference.

Background

Many Intelligent Transport Systems (ITS) technologies are believed to have the potential to enhance road safety, and to reduce road trauma if implemented on a wide scale [1]. However, large-scale deployment of ITS is unlikely to be successful unless drivers are prepared to purchase and use the systems. Acceptability of the systems to drivers will be an important factor in this choice.

Based on the models of Davis [2] and Neilsen [3], the acceptability of a system can be broadly defined by five constructs: usefulness, effectiveness, social acceptability, affordability and usability. To be useful, participants must perceive the system to serve a purpose. To be effective, participants must believe the system does what it is designed to do. Social acceptability concerns the broader social issues that participants may consider when assessing the acceptability of ITS, such as the acceptable level of control, and the impact on privacy. Affordability relates to how much participants are willing to pay to purchase, install and maintain the system. To be usable, participants must find the system easy to learn how to use, easy to remember how to use, easy and efficient to use, and satisfying to use.

Acceptance of ITS technologies may also be affected by the perceived intrusion of the warning systems when driving. To minimise such intrusion, it has been advocated that ITS technologies be designed such that drivers should be unaware they are driving a vehicle with ITS when they are driving safely [4]. This is important to ensure that the systems do not negatively impact on the workload drivers experience while driving. Indeed, a well-designed system might be expected to decrease driver workload.

Drivers' attitudes are also expected to play a role in public demand for ITS technologies. Attitudes to new technologies as a whole, and ITS specifically, will affect uptake of the systems. General road safety awareness and attitudes to unsafe driving behaviours will also be important predictors of public acceptance of the need for ITS.

The TAC SafeCar project commenced in June 1999. The on-road study was conducted between 2003 and 2005 to evaluate the potential safety benefits of several in-vehicle ITS, both alone and in combination with each other. The project was conducted as a collaborative research activity involving the Transport Accident Commission (TAC) of Victoria, the Ford Motor Company of Australia (Ford) and the Monash University Accident Research Centre (MUARC). The ultimate objective of the project is to stimulate demand for ITS systems in Victoria. As part of this study, the acceptability of ITS systems implemented in the SafeCar, the level of workload participants experienced while interacting with the systems, and attitudinal and other factors of interest were assessed. Selected final results pertaining to the acceptability of the SafeCar systems to drivers are reported in this paper. The final results pertaining to the effects of the SafeCar technologies on driving performance are reported in a companion paper presented at this conference [5].

Method

Fifteen Ford vehicles were equipped with Intelligent Speed Adaptation (ISA), Following Distance Warning (FDW), Seat Belt Reminder (SBR) and Reverse Collision Warning (RCW) systems. Twenty-three drivers each drove one of the vehicles for approximately 16,500 km. All drivers were exposed to the background systems (SBR and RCW) for all but the first 1,500 km. Fifteen drivers (the treatment group) were also exposed to the key systems (ISA and FDW) in specified periods throughout the study. The remaining eight drivers comprised the control group, and received no exposure to the key systems.

Data collection

Participants' driving behaviours, such as speed, following distance, and seat belt wearing were logged before, during and after exposure to the ITS systems to investigate the effects of the systems, both alone and in combination, on measurable driving performance. A series of questionnaires was also administered throughout the study, to collect subjective data relating to the acceptability of the systems, the level of workload drivers experienced while interacting with the systems, and attitudinal and other factors of interest.

Acceptability

All participants answered questions about the usefulness, effectiveness, social acceptability and affordability of the ISA and FDW at baseline (after training and prior to experience of driving with the systems). The acceptability of ISA and FDW was re-assessed at the end of the study after the treatment group participants gained experience with the systems.
All participants rated the usefulness, effectiveness, social acceptability and affordability of the SBR and RCW systems at baseline, at the end of the project, and at two intervening time-points. Inferential analyses were performed to determine if there were differences between the treatment and control group in terms of system acceptability, and if there were any changes in the acceptability of the systems over time.

Data pertaining to the usability of the systems was collected once, in the period that the participants were first exposed to the system. Only participants in the treatment group rated the usability of ISA and FDW systems. All drivers rated the usability of the SBR and RCW. Descriptive results are reported for system usability.

Externally, the test cars looked like other Ford Falcons. The difference was in the dashboard presentation, as shown in this photo.

Workload

Using the NASA raw task load index (NASA-tlx) questionnaire, participants were asked to rate the level of workload they experienced in several driving situations prior to the SafeCar systems becoming active, and then while the systems were issuing warnings. The NASA-tlx consists of six subscales (mental demand, physical demand, temporal demand, effort, performance and frustration level). Drivers rated their level of workload for each system on each subscale, from 0 to 100. An overall workload score was derived by averaging across the six workload dimensions.

Attitudes and other factors

Questions relating to attitudes and other factors were included in the questionnaires administered at the beginning and end of the study. The modified Driver Behaviour Questionnaire [6] was used to collect information on driver behaviour. Information about awareness of road safety issues, attitudes to driving behaviours, and attitudes to ITS was also collected.

Results

This paper presents a selection of the more interesting results from the questionnaires administered throughout the TAC SafeCar on-road study

Self reported baseline driving behaviour

Prior to exposure to the SafeCar Systems, drivers were asked about their usual driving behaviours. Baseline driving behaviour is reported for all 23 participants.

Speeding Behaviour: A large number of participants reported sometimes (65.2%) or often (26.1%) exceeding the speed limit by 3km/h or more. In most cases (87.6%), excessive speeding was claimed to be inadvertent.

Following Distance Behaviour: Approximately half of the participants said they never (13.0%) or rarely (39.1%) followed at a distance of less than 2 seconds from the car in front. The other half reported sometimes (13.0%), often (30.4%) or always (4.3%) doing so. At least a third of the participants reported inadvertently following too close to the vehicle in front, while at least 10 percent reported intentionally following vehicles too closely.

Seatbelt Wearing Behaviour: Almost all of the participants (91.3%) reported always wearing seatbelts. Those who did not always wear seatbelts (8.7%) chose not to wear them only while reversing. A number of participants (39.1%) reported that they did not always check to see if their passengers were wearing seatbelts.

Acceptability of the SafeCar Systems

Only data from participants who completed all of the acceptability questionnaires are included in the inferential analyses (11 treatment group participants and 8 control group participants).

Usefulness

General usefulness of the systems

Participants felt that all of the systems would be more of use than not of use, both prior to, and after, experience with these systems. At the beginning of the study, the relative ranking of the four systems in terms of usefulness was, from most to least: ISA, RCW, SBR (for passengers), FDW and SBR (for drivers). At the end of the study, the relative ranking in terms of usefulness, was: SBR (for passengers), RCW, SBR (for drivers), ISA and FDW.

Usefulness in particular speed zones and traffic situations

ISA was believed to be of use in 60km/h, 80km/h and 100km/h zones, on freeways, rural roads and when there is very little other traffic around. One notable exception was 50km/h zones, where participants did not feel that the ISA system was necessary.

The FDW system was rated as useful in various speed zones and traffic situations; for example, in 50km/h zones, rural roads, on freeways and for alerting tired drivers. After experience with the FDW system, over a third of the participants in the treatment group disagreed that the FDW system would be helpful on freeways, whereas none disagreed prior to using the system (this was not statistically significant).

The SBR was rated as useful, particularly for drivers who forget to put on their seatbelt, who do not wear seatbelts when travelling short distances, and for encouraging passengers to wear seatbelts. Participants recognised the need for the SBR system in various traffic situations, including where there was not much other traffic on the road. The SBR was less likely to be rated as useful when reversing.

Effectiveness

The ISA, FDW and RCW systems were rated as effective in reducing the incidence and severity of crashes. After experience with the ISA system, most participants in the treatment group still perceived it to be effective in reducing crash incidence and severity, but the proportion that thought it would be ineffective was higher than at the beginning of the study.

The ISA and FDW systems were rated as effective in reducing the probability of being fined. Initially, most participants also felt the ISA system would be effective in decreasing fuel consumption, however by the end of the project almost half believed it would have no effect. Importantly, most participants did not think the ISA system would change travel times.

Participants did not believe that they would rely too strongly on the systems at the expense of their own judgement. Participants disagreed that receiving warnings from any of the systems could distract them while driving and potentially compromise their safety. Participants agreed they would lose trust in systems that issue false warnings or fail to warn when they should.

Effectiveness in particular speed zones and traffic situations

ISA: Over 80 percent of participants regarded the ISA system as effective in reducing speed in 50km/h, 60km/h, 80km/h and 100km/h zones, and residential areas. Most drivers also regarded it as effective for reducing speed on freeways, rural roads, where there is little traffic and when road conditions are poor.

FDW: Initially, approximately half of the drivers felt the FDW system would be effective in increasing following distance in 50, 60, 80 and 100 km/h zones. At the end of the study, the perceived effectiveness of the FDW in these speed zones increased, as it did in situations where there is little traffic, in heavy traffic and where it is difficult to see the road ahead.

SBR: The SBR system was rated as effective in increasing seat belt wearing for short trips, when traffic levels are low, and when travelling at all speeds. Approximately half of the participants thought the SBR was effective in increasing seatbelt wearing when reversing.

Effectiveness of the systems for particular types of drivers

Participants believed that the ISA, FDW and SBR systems would be effective for drivers who inadvertently practice unsafe driving behaviours. They also believed that these systems would be less effective for drivers who intentionally practice unsafe behaviours.

Social Acceptability

Participants felt that the systems in the TAC SafeCar did not take too much control away from the driver. They were consistent in their preference for not wanting a system with more control.

Drivers generally did not wish to be able to turn the ISA, RCW and SBR systems on or off. After being exposed to the FDW system however, a larger number of participants in the treatment group wanted to be able to turn the system on or off (this difference was not significant).

Affordability

The median of the amounts participants reported being willing to pay for purchase of the ITS for new and existing cars, installation into existing cars, and maintenance/service is described below.

ISA: Participants were willing to pay $200 for purchase of the ISA for a new car and $110 for an existing car, with an additional $50 for installation.

FDW: Participants were willing to pay $100 for purchase of the FDW for either a new or existing car, with an additional $25 for installation into an existing car.

SBR: Participants were willing to pay $100 for purchase of the SBR for either a new or existing car and $22.50 for installation into an existing car.

RCW: There was a non-significant trend for participants in the control group to be willing to pay more for purchase of the RCW system for a new car (between $200 and $275 over time) compared to the treatment group (between $50 to $150 over time). The trend was also present for the amount participants were willing to pay for purchase of the system to retrofit to an existing car ($225 for the control group and $100 for the treatment group). Participants were willing to pay $45 for installation into an existing car.

Participants were not willing to pay for yearly maintenance/service of any of the systems.

Usability

Usability data for the ISA and FDW systems is available for 12 participants, all of whom had experienced the ISA and FDW warnings by that time. Usability data for the SBR and RCW is available for 21 participants, because two participants had not yet experienced SBR or RCW warnings by the time they received the usability questionnaire.

Participants reported little difficulty judging what any of the warnings meant. Both visual and auditory warnings were effective and satisfactory. The only exception was the yellow bars of the FDW visual ladder, which were not reported to be easy to use or effective.

The position of the ITS display screen was problematic for a few drivers, who reported difficulty in seeing some warnings. Some participants reported a preference for a display located directly in front of the driver. There were also concerns raised about glare and reflection off the screen. Suggestions were made for improving the audio tones, such as using speech warnings and having an adjustable volume for each individual warning, rather than an overall volume control. Noteworthy is that all the system interfaces were designed in accordance with ergonomics best practice.

Interest In Keeping The Systems

Most participants expressed interest in keeping the ISA, SBR and RCW, prior to and after experience with the systems. However, while interest in keeping the FDW was high prior to use, interest decreased over time for participants who had experienced the FDW system.

Initially, the systems were ranked in the following order in terms interest in keeping them (from most interest to least interest): SBR, ISA, RCW and FDW. At the end of the study, the RCW had moved up to top spot in the relative rankings: RCW, SBR, ISA and FDW.

Reasons for interest

Participants wanted to keep ISA because it was useful when inadvertently speeding, to avoid speeding fines, and to save fuel. The participants who expressed interest in keeping the FDW believed it would enhance safety and remind drivers to keep at a reasonable following distance. Reasons for interest in keeping the SBR included the decreased risk of injury in a collision when occupants are restrained, and to alert drivers when occupants were not wearing seat belts. Participants were interested in keeping the RCW because of the increased awareness it provides and because reversing was easier, particularly when rear visibility was poor.

Reasons for disinterest

Many of the reasons given for disinterest in keeping the ITS related specifically to the systems as implemented in the vehicle. The issue of false warnings was emphasised for the ISA system, particularly where the database was inaccurate. Participants in the treatment group who did not want to keep the FDW system found it gave too many unnecessary warnings which could be distracting, particularly when other drivers cut in front of them.

Workload

Participants were asked to rate the level of workload they experienced in several driving situations prior to the SafeCar systems becoming active, and then while the systems were issuing warnings. The data was derived from responses of drivers who returned the relevant questionnaire, and who reported experiencing ITS warnings. Hence the workload analyses are based on the responses of 10 drivers for ISA, 9 drivers for FDW and 21 drivers for SBR and RCW.

Participants reported significantly lower workload levels when reversing with the RCW system issuing warnings, compared to when they were reversing without the RCW. Participants in the treatment group rated their workload as significantly lower with SBR warnings than without, however there was no significant difference in the workload reported by the control group in this regard. Participants did not report any difference in the workload experienced while receiving warnings from the ISA or FDW systems, compared to when they were driving in the period prior to experiencing these warnings. However, participants did feel significantly more frustrated when receiving FDW warnings.

Attitudes and Other Factors

Driver behaviour

Conservative driving behaviours were reported, both before, and after, experience with the SafeCar systems. There was no difference between the reported behaviours of the treatment group and control group participants, nor was there any change after experience with ITS.

Awareness of road safety issues

The FDW and SBR systems had a positive effect on road safety awareness. After using the SBR system, fewer of the participants thought it was legal not to wear a seatbelt when driving at less than 10 km/h. The proportion of treatment group participants who were aware of the recommended minimum following distance almost doubled, from 55% to 100%, after use of the FDW system.

Attitudes to driving behaviours

The FDW system led to a change in attitude to driving behaviours; the treatment group drivers disagreed more strongly that it makes sense to tailgate if the driver in front is too slow after they had experienced the FDW warnings. Experience with FDW also led to a decrease in the perceived likelihood of being caught by the police for tailgating.

Attitudes to ITS

Participants agreed they would like a car that warns them in the following situations; exceeding the speed limit; tailgating; seatbelt non-compliance; impending collisions; driver blood alcohol concentration (BAC) over the legal limit; driver fatigue; and lane drifting. Participants did not want a car that prevents them exceeding the speed limit. At the beginning of the study, participants agreed they would like a car that stopped them tailgating, and a car that could not be started if someone was not wearing a seatbelt (interlock). However, they no longer wanted these intervening technologies at the end of the study, perhaps because they had experienced the more passive, warning systems. Participants agreed that they would like a car that prevented collisions and prevented drivers starting the car if their BAC was over 0.05, although the level of agreement decreased slightly over time.

Discussion

Intelligent Speed Adaptation

The large number of drivers that reported speeding inadvertently immediately highlights the potential benefit of the ISA system in reducing speed.

Although the drivers considered ISA to be necessary in most situations, they generally did not feel it would be necessary in 50km/h zones. It is unclear why. Considering the introduction of 50 km/h as the default speed limit in built-up areas in Victoria was quite recent, it may be expected that drivers would find the ISA system useful. However, this was not the case. Drivers may not believe they speed in 50km/h zones, although the logged driving data shows that ISA was effective in reducing speeding in 50 km/h zones. Perhaps drivers do not think it is likely they will be caught speeding in 50km/h zones, although penalties are not the only factor in speed choice. It is certainly not the case that drivers consider speeding in 50km/h zones to be safe; in fact, participants regarded exceeding the speed limit in 50km/h zones by 5km/h as dangerous, and by 10km/h as very dangerous.

There was a decrease over time in the extent to which the drivers perceived the ISA to be of use to them, and in how interested they were in keeping the ISA system. In contrast, the perceived usefulness of ISA in 60 km/h zones and 80km/h zones actually increased. It must be noted, however, that even with significant decreases in general usefulness and interest over time, the majority of drivers still rated the system highly, and most were still interested in keeping ISA.

Following Distance Warning

Approximately half of the drivers said they never or rarely followed at a distance of less than 2 seconds from the car in front. The other half reported sometimes, often or always doing so. Determining whether following distance behaviour was inadvertent is difficult, however at least a third of the subjects reported inadvertently following too close, while at least 10% reported doing so intentionally.

The FDW system was rated as effective in increasing following distance, particularly at the end of the study. Despite this, fewer participants wanted to keep the FDW system after experiencing it. The FDW system's very effectiveness may contribute to this. While drivers are generally aware of the need to keep a following distance of two or more seconds from the car in front, it is possible that they may not be aware of what this actually looks like. If drivers do not keep appropriate following distances, then FDW system warnings will occur frequently. If drivers receive warnings when driving in a manner they consider to be safe, frustration could occur. Many of the reasons given for not wanting to keep the system were related to frustration, and the workload ratings revealed a significant increase in frustration level when receiving FDW warnings. Drivers also found it unacceptable that the FDW system gave warnings when another car cut in front of them. Although it is clear that the FDW system was operating as it was designed to in this situation, these warnings were regarded as false alarms. This will have to be addressed if drivers are to consider FDW systems acceptable. It should be noted that the FDW technology used in this study was limited in that it was adapted to function under different driving conditions than it was designed to. Therefore, it was anticipated that refinements would need to be made to any commercial product if this ITS technology was to prove acceptable to the end consumer.

The FDW system had a positive effect on road safety awareness and attitudes to relevant driving behaviours. Experience with the system led to a greater awareness of the recommended following distance and decreased acceptance of tailgating when the driver in front is driving slowly.

The ISA and FDW warnings had no effect on the overall workload level that drivers felt while driving which is a positive result. While it might be reasonable to expect that extra visual and auditory warnings could increase drivers' perception of workload whilst driving, the results from this study show that this was not the case.

Seat Belt Reminder

Almost all drivers reported always wearing seatbelts. Those who didn't reportedly chose not to wear them only while reversing. The SBR system may, therefore, only be useful for drivers in limited situations. A number of drivers did not always check to see if their passengers were wearing seat belts and this identifies an important role for the SBR system.

It was encouraging that drivers found the SBR system useful, despite reporting rarely driving without a seatbelt. Drivers felt it would be particularly useful and effective for alerting them to unbelted passengers. The SBR system, as a device for warning the driver of unbelted passengers, was rated the most useful of all of the SafeCar systems, while for warning the driver that they were unbelted, it was ranked third most useful. Yet, drivers did not seem to think the SBR would be useful when reversing. This accords with the drivers' self-reports that reversing was the only situation in which they reported not wearing seat belts. Furthermore, although recommended to do so, it is currently legal for drivers not to wear a seatbelt while reversing a vehicle.

After using the SBR system, drivers were more likely to be aware of the requirement to wear a seatbelt when travelling slowly, which is a promising finding. Perhaps with more exposure to the SBR, there might also slowly develop an acceptance of the need for wearing seatbelts while reversing.

Drivers in the treatment group perceived their workload as significantly lower when receiving SBR warnings, compared to when they were driving prior to the SBR being operational. For drivers in the control group, however, there was a non-significant trend for the workload ratings to increase. It is unclear why the SBR system had such a different effect on the perceived workload of the two groups, when all of the drivers had the same SBR system in their cars.

Reverse Collision Warning

Drivers liked the RCW system, and found it both useful and effective. The RCW was ranked first in terms of how interested the drivers were in keeping the TAC SafeCar systems. It also ranked second in terms of perceived usefulness. The RCW system was particularly effective in reducing driver workload.

Overall usability

Overall, the systems were found to be usable, although some drivers felt the position of the visual warning display was not optimal. The drivers made several useful suggestions regarding how the usability of the system could be improved, both for the visual display and the auditory warnings.

Some drivers found the auditory warnings annoying. This is not surprising, since it is very difficult to ignore auditory warnings. The ability to attract a driver's attention regardless of the position of their head is one of the reasons that auditory signals are so effective as warning devices. However, auditory warnings should be used sparingly, for important messages, or else they can be annoying. It should be remembered that, in the TAC SafeCar, warnings were only issued when the driver was behaving in an illegal or unsafe manner, otherwise the systems remained silent.

Barriers to acceptance

Barriers to driver acceptance of the systems were identified. Drivers will lose trust in systems that are unreliable. Based on the amount that drivers were willing to pay for the systems, cost may also be a barrier to acceptance, particularly maintenance and service costs. It is encouraging that several potential barriers to acceptance turned out not to be of concern. Drivers found the level of control of the systems acceptable, they did not feel that they would rely too strongly on the systems at the expense of their own judgement, and did not think the systems would distract them from their driving.

General issues/limitations

The quality of self-reported behaviour data is always subject to the accuracy of self-report. Drivers may want to be regarded in a positive manner and thus report more acceptable behaviours. Drivers may also not be aware of how often they perform a specified behaviour. Self report data for any of the behaviours in this study could be subject to these problems.

The questionnaires that were used in this study were comprehensive. However, this meant they were also long and sometimes repetitive. Data quality can be affected if participants become bored and/or annoyed. The difficulty in designing questionnaires for this study was that previous research in this area had taken what the authors regarded as a piecemeal approach to subjective data collection. It was unclear what type of subjective data should be collected. Thus it was difficult to know how to reduce the questionnaire length while still retaining important concepts. Fortunately, the extensive subjective data collected during the TAC SafeCar study can now inform the design of subjective data collection instruments for future research of this sort.

Conclusions

Overall, the TAC SafeCar systems were rated as being acceptable in terms of their usefulness, effectiveness, social acceptability and usability. That is, the systems were considered to serve a purpose and to do what they are supposed to. Drivers were consistent in their belief that the TAC SafeCar systems would be effective for drivers who inadvertently practice unsafe driving behaviours and that the systems would be less effective for drivers who intentionally drive in an unsafe manner. None of the systems increased driver workload, and some positive changes to driver attitudes resulted from exposure to the ITS. Importantly, the two systems which were found to have the greatest effect in enhancing safe driving performances – the ISA and SBR systems – were also acceptable to drivers. On this basis, the authors recommend that these two systems be widely deployed on passenger vehicles in Victoria.

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Reducing road accidents through fatigue detection and monitoring: A review.

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Abstract

Driver fatigue is recognised as a major risk for road safety. Fatigue reduces drivers' ability to react to road and traffic conditions, resulting in potential serious injuries and fatalities. A method of reducing the risk of fatigue related accidents is through monitoring/detecting fatigue changes in drivers. Fatigue is shown to be associated with factors like psychological, physiological and performance based changes in drivers, and these could be used to indicate the occurrence of fatigue. This paper reviews the literature concerned with these measures, and discusses the implications of these measures for road safety as well as their limitations. Research suggests that these measures have the potential to be used in fatigue detection/warning systems. However, further research is needed before such devices could be implemented in vehicles as fatigue countermeasure devices.

Notations

ATSB Australian Transportation Safety Bureau
RTA Road Traffic Authority
TAC Transport Accident Commission, Victoria
EEG Electroencephalography
HRV Heart Rate Variability

Introduction

Driver fatigue accounts for approximately 20-40% of motor vehicle accidents (1, 2). It has been shown to affect physiological arousal, sensorimotor and cognitive functions, and thus impair a drivers' ability to react appropriately to road conditions (3). Brown (4) described " the main effect of fatigue to be a progressive withdrawal of attention from road and traffic demands, which may impair the drivers' ability to control the vehicle and/or to avoid collisions" (p.311). Furthermore, signs such as an increase in driver errors and slowing of reaction time also suggest that fatigue impairs cognitive processes (5). Research has found that the majority of drivers agree that their driving deteriorates as they fatigue, resulting in problems like slower reaction time and poorer gear changing (6). Due to these reasons, accidents resulting from fatigue are found to cause more severe damage and have a higher risk of resulting in fatalities (7). The Bureau of Transport Economics, Australia has estimated the annual cost of fatigue related road accidents to be as high as $3 billion (8). Driver fatigue is associated with loss of concentration, drowsiness, yawning, slow reaction time, sore or tired eyes and microsleeps (2), and is believed to be influenced by factors such as time of the day (9-11), age and gender (10,12,13,14) and work conditions (9,15,16,). For instance, Horne and Reyner (13,17) found that young adults were more likely to be involved in fatigue related accidents during the morning, and a roadside survey also found that tiredness is prevalent among young night-time drivers (18). RTA has reported that 46% of fatigue- elated accidents happened in highways (2), which could be accounted to monotonous and long distance driving in these roads.

Fatigue is more common among occupational drivers, and the problem of the risk of fatigue among Australian and New Zealand truck drivers is well recognised (3,9,19,20). Furthermore, 40-70% of truck drivers agreed that sleepiness is a problem while driving (9,16,21). However, the prevalence of fatigue related accidents has been found to vary between 5-50% (22). For example, The Transport Accident Commission (TAC), Victoria identified driver fatigue as the cause of 21% of fatal accidents in Victoria in 2003. Furthermore, fatigue accidents were believed to be responsible for around 70 deaths and approximately 500 serious injuries each year on Victorian roads (23). The Road Traffic Authority (RTA) of NSW reported 122 and 112 fatalities in 2000 and 2002 respectively, accounting for approximately 20% of fatalities (2). In contrast, the Australian Transportation Safety Bureau (ATSB) identified fatigue as the contributor of only 7% of accidents in Australia in 1998, based on coroner and police reports (22). This variation in statistics suggests that fatigue accident reporting is difficult, and this may be due in part to drivers' unwillingness to acknowledge they were fatigued for fear of prosecution and/or loss of insurance claims (13). A large number of fatigue related accidents could also go unnoticed and therefore the actual numbers could be higher than the figures recorded. For instance, a survey among New York State drivers revealed that 54.6% had driven while drowsy within a year, and 2.5% had driven in a very drowsy state (12). These variations could also be due to a lack of an agreed method to measure fatigue levels and this is a major problem associated with driver fatigue (22).

Attempts to define fatigue related accidents have been made. Horne and Reyner (17) identified characteristics such as a vehicle running off the road, brakes not being applied, speed over 50km/h, no obvious mechanical defect, driver blood alcohol level below legal limits, as evidence of inattention resulting from fatigue (17,24). The RTA (22,25) identify a fatigue related accident as (a) police identify the driver as being fatigued and/or (b) signs of loss of concentration due to fatigue (such as a vehicle moving to the wrong side of the road). The ATSB operational definition of fatigue accidents includes those that occur during " critical times" for fatigue related accidents, namely midnight to 6am and 2 to 4pm (22). There are limitations involved in measuring fatigue related accidents. For instance, fatigue can often be masked by prevalent factors such as speed and alcohol, and the presence of these factors increase the difficulty of assessing the impact of fatigue in an accident (26,27). Furthermore, these limitations have resulted in a lack of methods that can be used to identify a fatigued driver or to measure objectively the level of fatigue following an accident. Consequently, fatigue countermeasures have mainly focused on reducing fatigue related accidents through education and research. Clearly, additional countermeasure work needs to be conducted to improve this situation if we are to reduce fatigue related accidents in Australia.

Driver Fatigue Management

A number of initiatives have been introduced to reduce the risk of fatigue-related motor accidents. These countermeasures have focused on three key areas, which are, introducing driver-friendly road conditions, liaising with stakeholders and initiating education campaigns. Some of the improvements in road conditions include the introduction of driver rest areas (fatigue revive sites), profile line marking designed to warn drivers when they cross the lines and divided roads to minimise head-on collisions (head-on collisions are responsible for 38% of fatigue related accidents) (2). Education has been an important part of driver fatigue awareness campaigns. A television commercial entitled " Nightshift" aired in 1996 by TAC, carried the message " driver fatigue kills" , and is believed to have increased the public's awareness of the consequences of driving while fatigued (2). In 2001, the RTA launched its " Microsleep" "stop, revive, survive" campaign, educating drivers of the effects of microsleeps, and the importance of reviving when signs of fatigue begin to appear (2). However, despite increased awareness, drivers tend to rely upon less effective practices such as drinking tea/coffee, rolling down the window, listening to the radio, and talking to passengers as methods of reducing fatigue (4,6). Research in the Australian transport industry found the majority of bus drivers reported using strategies such as drinking coffee, listening to the radio, or rolling down the window whereas truck drivers more likely report sleep or taking breaks to avoid fatigue (6). Some studies have found that caffeine and short naps, especially when taken together, increase the driver's alertness (28). Research among college students in the USA found strategies such as talking to a passenger, snacking and rolling down the window help to avoid driver fatigue (29). Nevertheless, these strategies have been found to provide only short-term benefits (28), and more importantly, should not be relied upon to ensure the safety of drivers.

Another important area in the development of fatigue countermeasures is the use of fatigue detection and monitoring technology. Whilst still experimental, this technology has the potential to reduce fatigue related accidents and improve road safety. Therefore, the aim of this paper was to review the literature on existing fatigue detection/ monitoring methods and to explore their implications for driver fatigue countermeasure devices. A comprehensive literature search was conducted using Science Direct and Medline journal databases. Google was used to obtain particular articles and information on some countermeasure devices.

Fatigue Monitoring and Detection

Fatigue monitoring/detection should be considered an important component in the effective management of driver fatigue (30). A range of measures have been used to detect fatigue, and these vary due to a lack of an agreed definition of fatigue. In the literature, terms such as fatigue, sleepiness and drowsiness have been interchangeably used to describe the state of driver fatigue; however, these terms are distinct physiological states (7,21,31). For instance, Grandjean (32) referred to fatigue as a feeling of tiredness and reduced alertness, which impairs both capability and willingness to perform a task. Johns (7) defined sleepiness as sleep propensity or the probability of falling asleep at a particular time. Drowsiness has been defined as " the moment when persistent eyelid closure occurs (slow/prolonged eye closures as opposed to normal eye blinks)" (31,33). However, Williamson et al. (3) pointed out that physiological arousal and subjective experience should be considered when studying fatigue. More recently, Craig and colleagues also encouraged the notion that driver fatigue is both a physiological and a psychological phenomenon (31). In line with this, Hancock and Verwey (34) defined fatigue as " a multidimensional physiological-cognitive state associated with stimulus repetition, which results in prolonged residence beyond a zone of performance comfort" (p. 497). For the purpose of this paper, the term "fatigue", rather than "sleepiness" or " drowsiness" , will be used to describe tiredness phenomenon.

Driver fatigue is a complex, multidimensional phenomenon that gives rise to behavioural, physiological, and psychological changes in a person (3,7,34), and due to its complex nature measures of driver fatigue vary. Current fatigue monitoring/detection methods can be divided into three categories based on the method being used to measure fatigue. These are: (i) subjective/psychological measures of fatigue such as self-report, (ii) Performance measures such as steering errors and deviation in lane position, and (iii) physiological measures such as eye movement and brain wave activity. The search for reliable in-vehicle systems aimed to monitor, detect and alert drowsy drivers, has become a major goal of driver fatigue research. Therefore, the second two measures particularly are of interest in terms of their use in fatigue monitoring devices.

Fatigue countermeasures based on self-reported fatigue

Most of the early literature on driver fatigue has defined fatigue as a subjective experience that results in psychological and behavioural changes in a person (4,21). Brown (4) defined fatigue as " the subjective experience of tiredness and a disinclination to continue performing the current task" . Self-reported fatigue is commonly used in research (21). For instance, research found a moderate to high reliability between perceived alertness level and performance (35). Self-reported fatigue level of pilots increased with the time on the task and these subjective measurements were significantly correlated with performance decrements (36). Subjective measures of fatigue are preferred by those who are reluctant to use objective measures such as heart rate and brain wave activity, due to the intrusive nature of these measurements (5). Nevertheless, some researchers are less optimistic about the validity of self-reported fatigue, simply because a persons' ability to understand his/her own fatigue level is believed to be impaired when they are fatigued (30,31). Subjective reports of fatigue could also be susceptible to individual bias and differences (5) and some have suggested that individual differences influence self-reported fatigue (37). Therefore, subjective measures such as self-reports alone should not be used as a fatigue detection method. The self-assessment of fatigue may help to increase drivers' awareness of their fatigue level, and may assist them to determine their ability to continue driving. This method should be reinforced by driver education of fatigue and its consequences, if it is to be effective. Future research should give attention to improving current self-report measures.

Countermeasures based on monitoring driver performance

Driving performance measures are used to monitor the decremental effects of fatigue on the driver. Researchers have utilized performance measures such as steering wheel movements, lane/track position, maintenance of speed, and driving off the road and lane crossing (30,38). Most common changes in driving performance associated with fatigue include changes of speed and lateral lane position, and some have concluded that steering movement could be a valuable fatigue decrement measure (21). Research found that timing and design of warnings could prevent 85% of lane departures associated with fatigue (39). Some have argued that these performance measures could be used as fatigue countermeasures as they are designed to detect fatigue related deterioration in driving performance (30). In spite of this, some researchers have suggested that changes in driving behaviour caused by reasons other than sleepiness need to be investigated before using performance measures such as steering movement as a monitoring tool (21). For example, steering patterns and driving behaviour can also be affected by individual differences such as driver personality and experience. Furthermore, research in this area is still at the experimental stage, and the reliability and efficacy of these devices on real-road situations has yet to be comprehensively tested.

Countermeasures based on measuring physiological changes in drivers

The association between eye activity and fatigue has been well demonstrated (40). Researchers found that eye blink rate increases after sleep deprivation (41). Caffier and colleagues (42) found that alert eye closure during a blink occurs for around 200 ms (range from 100 to 300 ms) increasing to around 300 ms during fatigue (range from 200 to 450 ms). The blink rate of a person also increases as a person fatigues. However, researchers (40) advise that care should be taken when using blink rate as a measure, as it is influenced by factors other than fatigue. Nevertheless, eye activity can be considered a good indicator of fatigue (31, 36, 40,43-45). For instance, PERCLOS (percentage of eyelid closure over the pupil over time) identifies slow/prolonged eye closure compared to regular eye blinks and is considered to have potential as a fatigue monitoring device (30,46,47). Another system detects driver fatigue based on the movement of the eyes, and is focused on identifying episodes of microsleep (48). A camera continuously feeds-in images of the face to a processor and the system identifies a microsleep based on the time the eyes are open or closed, and the duration that the eyes are closed. The system warns the driver when fatigue is detected. Advantages as a fatigue detection method: they are non-invasive and most importantly, the method has been validated (30,33, 49). Although eye activity is a potential reliable measure for monitoring driver fatigue, using eye activity, especially eye closure, as a driver alerting device is problematic as eye movement changes appear in late stage fatigue (30). Furthermore, costs associated with installing devices such as a camera could be very high, and drivers may not want to bear additional costs. Issues of privacy may also be a concern, as few will like the idea of being under surveillance.

Electroencephalography (EEG) has been used as a measure of fatigue (41, 45,50-53). For example, altered alpha wave activity is associated with fatigue and impaired cognitive attention (53-55) and changes in alpha and theta waves were found to be related to fatigue and reduced performance (51). The results of much of this research suggest that EEG could be a useful measure of driver fatigue and importantly, enables fatigue levels to be measured directly. Attempts to utilize EEG in fatigue monitoring (56) employing an EEG based algorithm device have been trialled offline. Its usefulness for in-vehicle detection has yet to be demonstrated. However, a major barrier of using EEG is its intrusive nature. For instance, currently in order to record brain wave activity, a driver would need to wear a set of electrodes in some form of an attachment to the head, and one may suspect that most drivers would resent such an apparatus, regardless of safety benefits. In addition, artefact from eye/face/head movements can contaminate brain signals and therefore, real time mechanisms to detect and remove signal noise must be incorporated into EEG detecting systems.

Heart Rate Variability (HRV) and heart rate are additional measurements that could be used as indicators of driver fatigue. Research findings show a consistent relationship between fatigue and changes in heart rate and HRV, suggesting these measures could be promising indicators of driver fatigue. Increases in the sympathetic component of HRV have been found to be associated with fatigue (57-59) and research has found decreased heart rate and altered HRV during lengthy tracking tasks (60). These changes were associated with increased reaction times and fatigue (60). Heart rate/HRV measures have an advantage over EEG signals in that they are large signals and therefore less likely to be contaminated by artefact (e.g. eye blinks). Heart rate measures can also be considered to be less invasive and more adaptable to real-time driving conditions, compared to measures such as EEG. Physiological measures such as electrodermal activity may also be used as an indicator of fatigue. For example, a gradual change in galvanic skin resistance between awake and sleep states has been found, and skin resistance has been shown to be higher when participants were drowsy compared to an alert phase (61). However this measure has yet to be investigated for its usefulness in detecting and monitoring driver related fatigue.

Countermeasures based on measuring psychological predictors of fatigue

Another area of interest is the study of potential psychological traits and states that could be used to predict susceptibility to driver fatigue. Extraversion has been found to be a possible predictor of fatigue proneness. For instance, those who score higher on the extraversion-boredom dimension fatigue faster than those who score low on this trait (62) and extraverts display larger decreases in vigilance compared to introverts (63). In contrast, high fatigue scores were found for individuals who scored low on Emotional Stability, Extraversion, Conscientiousness and Strength of Excitation dimensions (64, 65). Despite the contradicting results, the extraversion construct is a potential personality measure of interest for measuring fatigue proneness, and needs to be investigated further. Anxiety is another factor that has been shown to predispose an individual to fatigue (31, 45, 66, 67). Individuals who were more anxious, depressive, less self-assured, more conscientious (rule-bound), less socially bold and less adaptable had shown a higher predisposition to fatigue (31). The Sensation-seeking construct is another trait shown to be associated with driver behaviour. High sensation seekers, who are more tempted to seek novel, varied and intense sensations and experiences, have been shown to be more at a risk of traffic accidents compared to low sensation seekers (67). Moreover, the sensation-seeking dimension has been shown to be significantly related to deviations of the steering wheel (68).

While a personality trait or a psychological status alone could not predict when someone would fatigue, these could provide a viable approach to understanding and managing driver fatigue. For instance, it could be used to predict the effects of individual differences on the appearance and extent of driver related fatigue. An understanding of the relationship between psychological factors and fatigue, and identifying possible psychological indicators of fatigue proneness would aid in enhancing current fatigue countermeasures. This knowledge could also be used for the benefit of professional drivers by designing shift/work patterns to suit individual needs, and in determining the task load for each person.

Conclusions

It is clear that fatigue has an adverse effect on drivers and that it presents a serious threat to road safety. One way of potentially addressing this problem is by utilising suitable measures and technology to monitor/detect fatigue. For this reason, a clear understanding of available fatigue detection/monitoring strategies and devices is essential. Despite the enthusiasm shown by many, some researchers remain sceptical about the use of fatigue detection/monitoring devices as a countermeasure strategy. For instance, MacLean (21) has expressed his concern that such devices may give drivers ‘ a false sense of security’ . Horne and Reyner (13) also argue that alerting devices may tempt drivers to take further risks, which commonsense would otherwise have prevented. They have proposed that self-awareness of driver fatigue should be encouraged as opposed to using in-car alerting devices. Desmond and Matthews (69) recommend that task-specific effects on fatigue should be considered when implementing in-car fatigue detecting systems. Factors such as the difficulty of tasks, performing secondary tasks and time-on task can have an effect on a person’ s vigilance level and the extent of fatigue (69, 70). Additionally, one assumes that fatigue detection/ monitoring technology would need to be highly reliable before it would be accepted (i.e. the technology should detect almost every fatigue occurrence, with few false positives). The technology would also need to be economically viable. These limitations provide real challenges to the development of fatigue detection/monitoring technology.

On the other hand, fatigue detecting devices that provide early warning (ie. before driving skills are impaired) could be valuable and may be more practical than devices that alert the driver once signs of fatigue have appeared. Williamson and Chamberlain (30) have pointed out that such early warning systems would give the driver the option to take necessary early avoidance measures such as drinking coffee, unlike late warning systems when the driver is already fatigued, in which case the only suitable step is to take a substantial break from driving. It is important to bear in mind that most detection/monitoring devices are still in the experimental stage, and the results of laboratory testing may not necessarily mirror the real-road experience (4, 5).

In the absence of a usable detection/monitoring device, practical strategies such as taking adequate breaks, planning trips/shifts, reducing sleep debt, and avoiding driving when fatigued remain the most viable countermeasures against driver fatigue. Danger hours should be avoided when planning long trips, and adequate rest/sleep periods between trips should be implemented to reduce fatigue (3). For example, irregular shifts force professional drivers to drive during circadian rhythm troughs which would result in a lower performance level (4) and risky driving behaviour.

Given the multi-factorial nature of fatigue, combining measures of performance, physiology and self-report has been recommended so that a clearer picture of an individual's level of fatigue can be obtained (31). This would enhance the understanding of the effects of fatigue and improve fatigue countermeasure technology. Furthermore, incorporating psychological indicators of fatigue should be considered when implementing fatigue detection strategies. For instance, this knowledge could be used in implementing a driver screening process to identify suitable drivers for varying shifts or used as a self-assessment guide before non-professional drivers take to the road. Most importantly, there is no substitute for sleepiness but sleep, and therefore it is important that drivers take adequate rest prior to driving. Individuals or authorities should never underestimate the consequences of fatigue, and investigating measures to detect/monitor driver fatigue with the ultimate goal of establishing a ‘ gold standard’ should remain a road safety priority.

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Road Safety Literature

New to the College Library

'AKILLA – In the blink of an eye – A drowsy driving handbook', by Martin S Jenkins, published by New Zealand Sleep Safety Limited, 2006.

This is an unusual little booklet. Included in the 15 or so sections are: ' Drowsy driving warning signs, what does not work, drowsy driving risk factors, coffee caution, sleep disorders and roadside stopping places' . The author writing in the Preface says, " Drowsy driving is one of the biggest killers on our roads today, but it hardly gets a mention compared to speeding and drink driving…It must be said that some road safety organisations such as in certain states of Australia have woken up to drowsy driving, but many authorities are ' sound asleep' and are totally failing in their duty to educate us on drowsy driving, while other road authorities could do much better. If I can save just one life, by getting people to read and pass on the information I've researched in my book " In the blink of an eye" , it will be worth it." The book (including postage) costs NZ $13 in New Zealand and NZ $15 for Australian purchases. For information on how to order the booklet, contact akilla@paradise.net.nz

Health Promotion and Health Education in Schools – Trends, Effectiveness and Possibilities, published by the RACV, June 2006.

This report involved an extensive literature review as well as discussions with ten leading school health and traffic safety education researchers and practitioners.

Traffic Safety Education and Health Promoting School – a Metropolitan and Rural Pilot Study, published by the RACV, June 2006.

This small pilot study involved two metropolitan and two rural schools which attempted to link Traffic Safety Education into mainstream school activities through the new Victorian Essential Learning Standards utilising the internationally accepted Health Promoting Schools framework.

Putting Triage Theory into Practice at the Scene of Multiple Casualty Vehicular Accidents: The Reality of Multiple Casualty Triage, published by the University of Canberra and the Canberra Hospital, October 2006.

Recent Publications

Australian Transport Safety Bureau

Australian Transport Safety Bureau, 2006, " Community Attitudes to Road Safety - Community Attitudes Survey Wave 19" , Report CR 229, Australian Government.

This report documents the findings from the Australian Transport Safety Bureaus latest survey of community attitudes to road safety. The nineteenth in a series of national surveys on community attitudes to road safety was conducted in February and March 2006. A total of 1,644 interviews were conducted with persons aged 15 years and over.

The issues examined include: perceived causes of road crashes, exposure and attitudes to random breath testing, attitudes to speed, perceptions of police enforcement, mobile phone use while driving, reported usage of seat belts, involvement in road crashes, and experience of fatigue while driving.

The complete report is available at: http://www.atsb.gov.au/publications/2006/CR229_Commuity_Attit.aspx

ATSB Report No. 2005/004
" Level Crossing Crash at Horsham, Victoria"
ISBN 1 921164 29 8
Publication date December 2005

At approximately 1213 Eastern Standard Time on 11 August 2005, a small motor vehicle drove into the path of a Pacific National locomotive, G535, on the Edith Street level crossing at Horsham in Victoria. The crossing is protected by flashing lights a bell, approach warning signs and road markings. The driver of the motor vehicle was fatally injured as a result of the collision.

The investigation found that the driver of the motor vehicle did not to give way to the train as prescribed in Road Rules Victoria. Based on available evidence it is believed that the driver of the motor vehicle was distracted by the intersection immediately ahead, Dooen Road, and/or personal issues and was apparently unaware of the trains presence, even though the level crossing warning devices were operating at the time of the accident.

Full report is available at: http://www.atsb.gov.au/publications/investigation_reports/2005/RAIR/pdf/rair2005004_001.pdf

Telephone: 02 6274 6478 or 1800 020616

Research Publications

Curnow WJ, 2006, **" Bicycle helmets and brain injury"** , Accident Analysis and Prevention, Elsevier Publishing. (Aranda, ACT 2614)

This publication is a response to criticism of a previous article [Curnow, W.J., 2005. " The Cochrane Collaboration and bicycle helmets" , *Accident Analysis and Prevention*, Vol. 37, pp.569-573] by Cummings et al. [Cummings, P., Rivara, F.P., Thompson, D.C., Thompson, R.S., 2006. *Accident Analysis and Prevention*, Vol. 38, pp. 636– 643]. The latter criticism disputed Curnow' s conclusion that his study establishes scientific evidence that all types of standard bicycle helmet protect against injury to the brain.

In response to the conclusion of Cummings et. al. that case-control studies in the review provide such evidence, Curnow explains that their design is inadequate to do this.

Franklyn M, Fildes B, Zhang L, Yang K, Sparke L, 2005, **" Analysis of finite element models for head injury investigation: reconstruction of four real-world impacts"** , *Stapp Car Crash Journal*, ISSN 1532-8546, Vol. 49, pp. 1– 32, Society of Automotive Engineers.
(Monash University Accident Research Centre, Victoria)

The conclusion of previous studies into the cause of head injuries is that both excessive linear and rotational accelerations are involved. Although the head injury criterion has been beneficial as an indicator of head injury risk, it only considers linear acceleration, so there is a need to consider both types of motion in future safety standards. To gain a better understanding of head injury biomechanics, recent developments include advanced models of the head/brain complex. There is a lack of suitable real-world data available to confirm the verification of these models against laboratory experimental data,

Two computer models of the head/brain were used in the current study. The objective was to reconstruct four real-world crashes with known head injury outcomes in a full-vehicle crash laboratory, simulate head/brain responses using kinematics obtained during these reconstructions, and to compare the results predicted by the models against the actual injuries sustained by the occupant.

The cases selected were:

- where the vehicle occupant sustained no head injuries (AIS 0);
- head injuries of severity AIS 4, AIS 5, and
- multiple head injuries.

Data collected from a 9-accelerometer skull were input into the Wayne State University Head Injury Model (WSUHIM) and the NHTSA Simulated Injury Monitor (SIMon).

The results demonstrated that both models were able to predict variation in injury severity, consistent with the difference in AIS injury levels in the real-world cases. The WSUHIM predicted a slightly higher injury threshold than the SIMon, probably due to the finer mesh and different software used for the simulations, and could also determine the regions of the brain which had been injured. With further validation, finite element models can be used to establish an injury criterion for each type of brain injury in the future.

Gossner O, Picard P, 2005, **" On the Consequences of Behavioral Adaptations in the Cost-Benefit Analysis of Road Safety Measures"** . pp. 577– 599, *Journal of Risk Insurance,* Vol. 72, No. 4.

Some argue that road safety measures or automobile safety standards fail to save lives because safer highways or safer vehicles induce more dangerous driving. A similar but less extreme view is that ignoring the behavioral adaptation of drivers would bias the cost/benefit analysis of a traffic safety measure.

This study outlines cost-benefit rules for automobile safety regulation when drivers may adapt their risk-taking behaviour in response to changes in the quality of the road network. The focus is on the financial externalities induced by accidents because of the insurance system as well as on the consequences of drivers' risk aversion. The authors establish that road safety measures are " Pareto improving" if their monetary cost is lower than the difference between their (adjusted for risk aversion) direct welfare gain with unchanged behavior and the induced variation in insured losses due to drivers' behavioral adaptation. The article also shows how this rule can be extended to take other accident external costs into account

Ivers RQ, Blows SJ, Stevenson MR, Norton RN, Williamson A, Eisenbruch M, Woodward M, Lam L, Palamara P, Wang J, 2006, **" A cohort study of 20,822 young drivers: the DRIVE study methods and population"** , pp. 385– 389, Journal of *Injury Prevention*, Vol. 12, No. 6, BMJ Publishing Group.
(The George Institute for International Health,
The University of Sydney).

This research (the DRIVE Study) on young drivers addressed the need to directly link risk factors to serious injury and death outcomes. To demonstrate that the necessary heterogeneity in risk factors has been attained, the publication outlines the study methods and describes the participants of the study.

Drivers aged 17-24 years, holding their first-stage New South Wales provisional driver's licence, were recruited into a prospective cohort study. The participants were contacted by mail and asked to complete the study questionnaire. Baseline data collection involved a questionnaire with questions to drivers about their training, risk perception, driver behavior, sensation-seeking behavior and mental health. Consent for prospective linkage of their data on licensing, crashes and injuries, held in routinely collected databases, was obtained from participants.

The baseline questionnaire was completed by 20,822 drivers (45.4% male, 74.3% resided in capital cities and 25.7% in regional or remote areas). The recruited study population showed a wide variation in the risk factors under examination. For example, almost 40% of drivers reported drinking alcohol at hazardous levels and about 32% of participants seemed to be at a high or very high risk of psychological distress. Participants reported a mean of 67.3 hrs (median 60 hrs) of supervised driver training while holding their learner's permit.

It was concluded that analyses of baseline data showed substantial heterogeneity of risk factors in the study population. Subsequent prospective linkages comparing relative differences in exposures at baseline with the outcomes of interest have the potential to provide important new information needed to develop targeted interventions aimed at young drivers. The DRIVE Study has a robust study design aimed at minimizing bias in the collection of outcome data.

Langford J, Koppel S, Andrea D, Fildes B, 2006, **" Determining older driver crash responsibility from police and insurance data"** , pp. 343– 351, *Traffic Injury Prevention*, Vol. 7, No.4 , Taylor and Francis Group (Accident Research Center, Monash University, Victoria)

This study aimed to determine the extent to which older drivers can be considered responsible for their crashes, to identify key factors in those crashes for which older drivers have been judged responsible, and to assess the extent to which older drivers' extra crash responsibility contributes to the road toll. Insurance claims from the State of Tasmania, Australia, for 1998-2002 were linked with police records for crashes involving drivers aged either 41-55 years or 65 years or older. Insurance and police data sets contained independent judgments of crash responsibility. There was a high level of agreement between the two sets of judgments, with older drivers judged around 1.5 times more likely to be responsible for their crashes than middle-aged drivers and, conversely, older drivers were around 0.6 as likely to be absolved from crash responsibility. It was concluded that older drivers' additional crash responsibility while valuable in explaining "what went wrong," currently makes only a small contribution to the overall road toll.

Lewis G, 2006, **" Motorcycle crash investigation: Performance testing and review of previous studies"** , pp. 32– 43. *Collision*, Vol. 1, No. 2, Collision Publishing

It is relatively simple to determine a deceleration rate in the analysis of motor vehicle collisions, involving passenger cars and/or light trucks. Vehicles with conventional braking systems usually "lock up the tyres" in pre-impact skids and the tyres are often locked by vehicle damage post-collision. The percentage of the vehicle's weight remains fairly constant during the pre-impact and post-impact phases of the collision. Assuming vehicles are uncontrolled post-impact, vehicles with *ABS systems* perform rather uniformly during "skidding" or hard braking maneuvers, and usually react predictably and similar to vehicles with *conventional braking systems*.

However, motorcycles have unique braking systems. There are two separate brake controls on the vast majority of motorcycles, and sometimes there are different types of brakes on each wheel. Some motorcycles have integrated braking systems and a few models have ABS systems. Previous studies have shown that it is difficult for the motorcycle operator to efficiently control two independent brakes during hard braking maneuvers. Add to that the reduced fine motor skills during stressful situations, such as impact avoidance, and it is even more difficult to effectively utilize the brakes on a motorcycle. Limited rider training in the proper use of motorcycle brakes further reduces the effectiveness of the vehicle/rider braking capability.

McEvoy SP, Stevenson MR, Woodward M, 2006, **" The prevalence of, and factors associated with, serious crashes involving a distracting activity"** , *Accident Analysis and Prevention*, Elsevier Publishing (The George Institute for International Health, The University of Sydney)

The objectives of the study were (a) to determine the prevalence and types of distracting activities involved in serious crashes and, (b) to explore the factors associated with such crashes.

Interviews were conducted with 1367 drivers who attended hospital in Perth, Western Australia following a crash between April 2002 and July 2004. A structured questionnaire was administered to each driver and supplementary data were collected from ambulance and medical records.

Over 30% of drivers (433, 31.7%) recalled at least one distracting activity at the time of crashing and driver distraction was reported to have contributed to 13.6% of all crashes. The major distracting activities were:

- conversing with passengers (155, 11.3%),
- lack of concentration (148, 10.8%) and
- outside factors (121, 8.9%).

Logistic regression was applied. A distracting activity at the time of a crash was significantly more likely among *drivers with shorter driving experience* (0-9 years, 38.3% versus >/= 30 years, 21.0%, p<0.001). Distracting activities (the types of activities reported are varied) at the time of serious crashes are *common* and can cause crashes.

- increased driver awareness of the adverse consequences of distracted driving with a focus on novice drivers, enforcement of existing laws (e.g. those requiring a driver to maintain proper control of a vehicle), and
- progress on engineering initiatives (such as collision warning systems) are needed to reduce injury.

Mihai F, 2006, **" Literature Review of Community Consultation Techniques used by Road Agencies"** , ISBN 1 921139 76 5, Austroads, Sydney.

The decision making process should be supported by the end user. The ability to respond to the needs of road users and the broader community is facilitated by community consultation. There is a need for road agencies to enhance their ability to assess community expectations and requirements, and incorporate community needs and priorities in their decisions.

This document provides a review of existing literature on community consultation techniques that have been used by Austroads members and other road agencies. (A pdf-format version of this document is available at no cost. However, it is necessary to register before downloading the file. http://www.austroads.com.au/cms/Publications)

Paulozzi LJ, Ryan GW, Espitia-Hardeman VE, Xi Y, 2006,
" Economic development's effect on road transport-related mortality among different types of road users: A cross-sectional international study" , *Accident Analysis and Prevention*, Elsevier Publishing)
(volume, issue, and page range not yet available)]

The relationship between the stage of economic development and the motor vehicle crash (MVC) mortality rate in any one country is not defined for different road users. This report presents a cross-sectional regression analysis of recent national mortality in 44 countries using death certificate data provided by the World Health Organization. For five types of road users, MVC mortality is expressed as deaths per 100,000 people and per 1000 motor vehicles. Economic development is measured as gross national income (GNI) per capita in U.S. dollars and as motor vehicles per 1000 people.

The results showed overall MVC mortality *peaked* among low-income countries at about US$ 2000 GNI per capita and at about 100 motor vehicles per 1000 people. Overall mortality *declined* at higher national incomes up to about US$ 24,000.

Most changes in MVC mortality associated with economic development were explained by changes in rates among non-motorised travelers, especially *pedestrians*. Overall MVC rates were lowest when pedestrian exposure was low because there were few motor vehicles or few pedestrians, and were highest during a critical transition to motorised travel, when many pedestrians and other vulnerable road users vied for use of the roadways with many motor vehicles.

Routley V, Ozanne-Smith J, Brennan C, 2006,
" Motor vehicle exhaust gas suicide in Victoria, Australia 1998-2002" , pp. 119– 124, *Crisis* (Journal of International Association for Suicide Prevention), Vol. 27, No. 3, Hogrefe and Huber Publishers.
(Authors at Monash University Accident Research Centre, Victoria.)

Motor vehicle exhaust gas suicide is the second most frequent method of suicide in Victoria, Australia. It is a highly lethal method of suicide. Australian regulations require all vehicles manufactured since 1998 to have a maximum carbon monoxide exhaust emission level of 2.1 g/km, reduced from the previous level of 9.6 g/km.

Information surrounding all suicides from exhaust gas in Victoria between 1998– 2002 was analyzed. The objective was to determine whether suicides occurred in vehicles with the lower emission levels. Between 1998– 2002, 607 suicides by this means were recorded while just 393 hospital admissions were recorded for the same period. Mean carboxyhaemoglobin levels were significantly lower in fatalities using vehicles manufactured from 1998, however suicide still occurred in these vehicles (n = 25).

The extent to which the new regulations contributed to the relatively low rate of suicide in vehicles less than 5 years old, compared to their frequency in all vehicles remains unknown. Based on international experience and the age of the all vehicles on Victorian roads, it may take well over a decade until substantial decreases in suicide from vehicle exhaust gases are observed in the absence of active preventive measures.

Conference Papers

Rea M, Murray W, Darby P and Dubens E, Nov. 2004,
" Comparing IT-based driver assessment results against self reported and actual crash outcomes in a large motor vehicle fleet" , Road Safety Research, Education and Policing Conference, Perth WA.

The full version of the above paper is available from:

Interactive Driving Systems
UK-AUSTRALIA-EU-USA

Telephone: ++ 44 (0) 1484-400399
Mobile: ++ 44 (0) 7713-415454

Email: will.murray@virtualriskmanager.net

Other Publications

Office of Road Safety WA, Dec. 2006, **" A Guide to Revised Traffic Infringement Penalties in Western Australia"** , brochure ORS 223-12-06.

A major review of the *Road Traffic Code 2000* has resulted in the revision of some 50 different traffic offences. These changed regulations are comprehensive and are in the categories of speeding (light vehicles and heavy vehicles), non-use of seat belts and restraints, turning vehicles, traffic control signals, giving way, traffic signs and road markings, roundabouts, driving provisions, lights and warning devices, pedestrians, bicycle riders, duties of persons travelling on or in a vehicle, drivers of public buses, and duties of drivers.

(Information on changes may be obtained from:
www.officeofroadsafety.wa.gov.au/penalties)

APPLICATION TO BE REGISTERED AS A ROAD SAFETY PROFESSIONAL

(Note: Applicants must be current Fellows or Associate Fellows of the College)

Full Name			
Postal Address			
Telephone No.	( ) -	Facsimile No. ( ) -	
Email address			
Academic qualifications	(Provide documentary evidence of qualifications)		
Current work position			
Name of employer			
Work experience relevant to road safety	(Note: Be sure to include details of any specific tasks as listed in the 'Minimum Standards' table, attaching a separate sheet if necessary)		
Your publications	(Attach a separate sheet if necessary)		
and/or presentations on road safety			
Other essential minimum standards	(Address any other essential minimum standards referred to in the table for your field, attaching a separate sheet if necessary)		
Driving record	Have you had a driving conviction resulting in suspension/loss of licence in the past ten years? **Yes No** Circle correct answer and if 'Yes' give details on a separate sheet		
Criminal record	Have you been convicted of a criminal offence in the past ten years? **Yes No** Circle correct answer and if 'Yes' give details on a separate sheet		
Referee No.1 contact details	Name:	Address:	Telephone No: ( ) -
Referee No.2 contact details	Name:	Address:	Telephone No: ( ) -

My application to become a Registered Road Safety Professional is in the field/s of (circle as appropriate):

Administration/Policy   Audit   Driver Education   Enforcement   Engineering
Medicine   Occupational Health and Safety   Psychology
Research/Evaluation   Road Crash Reconstruction   Road Safety Education

Signed ____________________ Date ____________________

Please post this form to: The Register of Road Safety Professionals, ACRS, PO Box 198, Mawson, ACT 2607 together with a payment of $200 (inclusive of GST).Note: Half the application fee is refundable if the application fails.

Do you require a tax invoice? (circle as appropriate)   Yes   No

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